Peptic Ulcer Disease: Deciding What Procedure When

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Benjamin R. Veenstra and Daniel J. Deziel

There are elegant operations to be done for peptic ulcer disease (PUD), operations that eliminate the source and stimulation of acid secretion according to the best anatomic and physiologic principles. Acid is a necessary component of PUD, as seminally articulated by Karl Schwarz in 1910: "Ohne saueren Magensaft kein peptisches Geschwur" ("Without acidic gastric juice, no peptic ulcer") [1]. However, acid is not necessarily a sufficient cause. Recognition of the multifactorial etiology of PUD, particularly the contributory roles of infection with *Helicobacter pylori* and the use of nonsteroidal anti-inflammatory drugs (NSAIDs), has enabled successful nonoperative management in a majority of cases. The frequency of hospital admissions and of operations for PUD has declined [2–4]. Current surgical trainees have limited exposure to definitive antiulcer procedures. Hence, these elegant curative operations have nearly become a historical teaching point. Nevertheless, urgent operations for the complications of PUD remain a steadfast scenario for surgeons.

The contemporary indications for surgery in PUD, by order of decreasing frequency, are generally perforation, bleeding, obstruction, failed medical management (intractability, recurrence), and concern for malignancy. When an operation for PUD is indicted, there are multiple options to consider with various types of resection, vagotomy, and reconstruction. The goals are to treat any immediate ulcer complication, to promote ulcer healing, to prevent ulcer recurrence, and to minimize undesirable sequelae. The choice of operation is always a balance between curative treatment of the ulcer disease and postoperative consequences. Surgical management of PUD is thus a compromise, albeit a lifesaving one.

B. R. Veenstra (✉) · D. J. Deziel
Department of Surgery, Division of MIS and Bariatrics, Rush University Medical Center, Chicago, IL, USA
e-mail: Benjamin_Veenstra@Rush.Edu

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The rational selection of an operation for PUD depends upon these factors:

1. Understanding of the specific disease process (diagnosis/ulcer location, etiology)
2. Suitable operative conditions (inflammation, contamination, prior interventions, tissue characteristics)
3. Suitable patient (hemodynamic stability, comorbidities, potential for compliance)
4. Suitable surgeon (a surgeon's personal experience and capability)
5. Local resources (assistants, equipment, support services)

This chapter provides some comments on the selection of the operation in various ulcer scenarios and offers what we most typically do in our own practice. Operations for PUD can be satisfactorily accomplished by either laparoscopic or open methods. The approach should be determined according to the surgeon's experience, the local environment, and the pathology at hand. Emergent operations should be conducted properly and with dispatch.

Perforation

Perforation is the most frequent complication of PUD that prompts surgery in the United States [5, 6]. Perforation has the highest mortality rate of ulcer complications, especially perforated gastric ulcer [7]. The preferred operative management is largely dictated by ulcer location but must be tempered by local pathologic conditions and by the status of the patient. Approximately one-half of perforated ulcers are in the first portion of the duodenum, and the other half are pyloric, prepyloric, antral, or in the gastric body.

For duodenal perforations, the primary goal is closure and peritoneal washout. Closure is accomplished by use of a Graham patch of omentum or with the falciform ligament. We prefer to place the sutures as seromuscular bites in healthy tissue with one bite taken on each side of the perforation away from the friable edge. Graham's original article illustrates through and through sutures passed from one side of the perforation to the other, into which a free or attached piece of omentum is incorporated [8].

The operation is limited to patch closure alone for patients with shock, delayed presentation and significant peritoneal contamination and for most patients who have not previously been treated for PUD. Given the prevalence of *H. pylori* and of NSAID use, there has been a trend in some settings toward repair of the perforation alone without a definitive antiulcer operation for essentially all patients with perforated duodenal ulcer. This approach is based on the assumption that subsequent medical management will be sufficient for ulcer healing and prevention of recurrence. This is a leap of faith. Surgeons must understand some key considerations before blindly adopting this strategy.

Among patients requiring urgent operations for perforated PUD, fewer than one-half of those who are tested for *H. pylori* will prove positive, and only about one-half will have a history of NSAID use [5, 6, 9]. One-third of patients undergoing urgent PUD operations have already been receiving ulcer treatment at the time of the complication [6]. PUD may be refractory or recurrent for numerous reasons including persistent *H. pylori*, inability to eliminate use of NSAIDs or other ulcerogenic medications, inadequate pharmacologic acid suppression, and continued smoking. Unfortunately, much of this may not be known at the time of an emergent or urgent operation. When operative conditions permit, we consider whether a definitive operation may be beneficial. If the determination is yes, we usually extend the perforation and perform a pyloroplasty with truncal vagotomy. If the patient and peritoneal cavity permit and the surgeon is experienced, we perform a highly selective vagotomy following closure of the perforation.

Local ulcer characteristics also influence the choice of operation. So-called "giant"' (>2 cm) duodenal ulcers and ulcers with considerable fibrosis are associated with a higher risk for complications and recurrence. For these ulcers, we recommend truncal vagotomy and antrectomy with a Billroth II reconstruction if the patient is stable.

Perforated pyloric or pyloric channel ulcers often do not do well following closure alone. Therefore, we recommend pyloroplasty with either a truncal vagotomy or a highly selective vagotomy when conditions are suitable [10].

Perforated gastric ulcers pose a highly morbid situation. The preferred operation is gastric resection. Unfortunately, the condition of the patient may only allow a limited procedure. When formal gastrectomy is not prudent, the ulcer is excised or generously biopsied, and patch or primary closure is carried out as a compromise. When possible, we perform a subtotal gastrectomy to include resection of the ulcer and add truncal vagotomy for patients who have type II (combined duodenal and gastric ulcers) or type III (prepyloric) gastric ulcers.

Hemorrhage

Bleeding is the most frequent complication of PUD that results in hospital admission [2]. *H. pylori* and NSAID use are risk factors that contribute to bleeding, as they do to perforation. Patients that come to operation for bleeding PUD are typically on intense acute antisecretory therapy and have failed one or more endoscopic attempts to control hemorrhage, with or without additional angiographic interventions. Accordingly, a definitive acid-reducing operation is advisable once the bleeding has been stopped.

Duodenal ulcer hemorrhage is controlled through a longitudinal duodenotomy over the first portion of the duodenum. The bleeding vessels will be the superior and inferior aspects of the gastroduodenal artery and the transverse pancreatic artery. These are secured by direct suture ligation with multiple sutures. The gastroduodenal artery can also be separately ligated outside the duodenum. If not already done,

the duodenotomy is extended across the pylorus, and pyloroplasty and truncal vagotomy are performed. If it has been possible to secure the vessels through a duodenotomy with an intact pylorus, highly selective vagotomy is an option for an experienced surgeon with a stable patient.

Bleeding gastric ulcer disease that requires operation is preferably treated by gastric resection and Billroth II reconstruction. Vagotomy is not necessary, although it is not objectionable. For compromised patients who fail nonoperative control but cannot tolerate a formal gastrectomy, the chance for a successful outcome is guarded. Ulcer oversewing or excision (due to risk of malignancy) with truncal vagotomy and pyloroplasty is an option if it can be performed expediently.

Gastric Outlet Obstruction

Patients who require an operation for PUD complicated by gastric outlet obstruction have chronic disease with significant fibrosis. Most frequently this is consequent to ulceration of the duodenum or pyloric channel, but gastric cancer must be excluded. The optimal operation will depend upon the findings at the time of surgery and the fitness of the patient. In our current experience, distal gastrectomy with truncal vagotomy and Billroth II reconstruction provides satisfactory relief for many patients. Vagotomy is not done when there has been prolonged obstruction with gastric atony. Likewise, Roux-en-Y reconstruction is a poor choice as it may compound delayed gastric emptying with the roux stasis syndrome.

At operation, prior to embarking on resection, an assessment must be made as to whether the duodenum can be safely mobilized and divided and securely closed. Ulcer disease with obstruction is often associated with considerable anatomic distortion. Injury to the bile ducts, pancreas, and major adjacent vessels is an inherent risk. Combined operative injury to the main pancreatic duct and bile duct has most frequently occurred during gastrectomy.

Some method for gastric drainage must be established if resection is not feasible. Fibrosis that is so pronounced as to prohibit resection will also usually render pyloroplasty untenable. However, if healthy enough tissue is accessible, a Jaboulay gastroduodenostomy might be accomplished. Otherwise, a gastrojejunostomy is created on the posterior aspect of the stomach. Concurrent placement of a gastrostomy tube for drainage and a feeding jejunostomy is advisable and may alone be the safest surgical option for the most infirm patients.

Occasionally, patients undergoing operation for gastric outlet obstruction are found to have a limited pyloroduodenal stenosis. This can be remedied with pyloroplasty in Heineke-Mikulicz fashion or with a version of gastroduodenostomy (Jaboulay, Finney).

We perform a truncal vagotomy in conjunction with either pyloroplasty or gastrojejunostomy, except when there is concern for gastric motility. Some have successfully coupled highly selective vagotomy with Jaboulay gastroduodenostomy [11] or gastrojejunostomy [12].

Intractability

Elective operations for intractable PUD are infrequent these days. For a variety of reasons however, ulcers may be refractory or recurrent with nonoperative management or after prior ulcer operations. These patients remain a challenge for which the properly selected and executed operation can be reparative. The choice of procedure is predicated on patient factors, pharmacologic factors, physiologic factors, and pathologic factors. The operation is a balance between the risk for ulcer recurrence and for postoperative digestive disturbances including diarrhea, dumping, and bile reflux.

In the current era, patients with medically intractable duodenal ulcer are unusual and usually have pronounced pathologic changes with ulcers that are deep, penetrating, or extensive. Antrectomy with truncal vagotomy remains our surgical standard for this group.

For patients with less severe pathologic disruption and intractable disease, a highly selective vagotomy is preferred. This includes division of the branches from the nerves of Latarjet to the parietal call mass along the anterior and posterior lesser curvature, dissection of the gastroesophageal junction and distal esophagus with division of the upper short gastric vessels and any posterior vagal branches to the fundus (nerves of Grassi), and division of the right gastroepiploic vessels and accompanying recurrent vagal fibers (nerve of Rosetti). As this can be tedious laparoscopically, some prefer a laparoscopic posterior truncal vagotomy and anterior seromyotomy (Taylor procedure), although that has not been our practice.

Elective management of intractable gastric ulcer must exclude cancer. We perform ulcer resection by subtotal distal gastrectomy and Billroth II reconstruction. Truncal vagotomy is also done for type II or III ulcers. Type IV ulcers high on the lesser curvature can be included in the resection by a variety of configurations or by separate excision. Care must be exercised to avoid compromise of the gastroesophageal junction and to obtain a sound anastomosis.

Summary

The number of operations necessary for PUD has declined substantially over recent decades. However, urgent operations for perforation and bleeding are still required with some regularity. Elective operations for refractory disease and gastric outlet obstruction are far less common but can be curative. A spectrum of classic ulcer operations must remain in the surgical armamentarium for properly selected patients.

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