



The Evolution of Surgical Procedures in the Management of Duodenal and Gastric Ulcers

Evolution des Techniques Chirurgicales dans le Traitement de la Maladie Ulcéreuse Gastroduodénale

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ABSTRACT

Surgical procedures for the surgical management of duodenal ulcer had evolved through many stages, over the years. It started with gastroenterostomy alone, then followed by subtotal gastrectomy, vagotomy alone, vagotomy and gastrojejunostomy, vagotomy and pyloroplasty, and highly selective vagotomy – all which started as open surgical procedures. Now unless there are complications the treatment is essentially medical following the work of Marshall and Warren. Currently, even when surgery is indicated, minimal invasive procedures are preferred.

Four main types of pyloroplasties are well known. They are Weinberg, Heinecke-Mikulicz, Finney and Jaboulay.

Vagotomy can be truncal, selective, and highly selective.

Accepted surgical treatment for gastric ulcer is the distal gastric resection to include the ulcerated area, but not resecting more than 50–60% of the stomach.

In the uncommon cases of Zollinger-Ellison syndrome, aggressive gastric surgery, the use of drugs, and the resection of the tumour have all been recommended in appropriate cases.

With the discovery of *Helicobacter pylori* and its effective medical treatment, surgery has little role in the initial management of peptic ulcer disease. The place of the history of the surgical procedures employed earlier in the treatment of this disease would remain relevant. *WAJM* 2013; 32(3): 159–162.

Keywords: Evolution of surgical procedures, Duodenal and gastric ulcers, *Helicobacter pylori*.

RÉSUMÉ

Les techniques chirurgicales dans la prise en charge de l'ulcère duodénal ont connu une évolution à plusieurs étapes dans le temps. Elles sont parties d'une gastroentérostomie isolée suivie d'une gastrectomie subtotale avec vagotomie puis d'une vagotomie avec gastrojéjunostomie et présentement on réalise une vagotomie avec pyloroplastie. Mais en dehors d'une complication, le traitement est essentiellement médical depuis les travaux de Marshall et Warren.

Quatre types de pyloroplastie sont bien connues. Il s'agit des techniques de Weinberg, Heinecke-Mikulicz, Finney et Jaboulay.

La vagotomie peut être tronculaire, sélective ou très sélective. Le traitement approuvé de l'ulcère gastrique consiste en une résection gastrique distale n'emportant pas plus de 50 à 60% de l'estomac.

Dans les cas du syndrome de Zollinger-Ellison, une chirurgie gastrique agressive, l'usage de médicaments et la résection de la tumeur ont tous été recommandés selon les cas.

Toutefois, récemment avec la découverte de *Helicobacter pylori* il semble qu'en dehors des complications, la chirurgie ait un rôle limité dans le traitement de l'ulcère. *WAJM* 2013; 32(3): 159–162.

Mots Clés: Évolution des techniques chirurgicales, ulcère duodénal et gastrique, *Helicobacter pylori*.

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INTRODUCTION

Duodenal ulcer is a world-wide affliction and it is seen in all races. It is known to start receiving the attention of medical personnel since the 20th century. The early workers that brought this disease into prominence were Wilbur,¹ John Abercrombie of Edinburgh in 1828, as well as Perry and Shaw from Guy's Hospital who reviewed duodenal scarring from autopsy performed in Guy's Hospital from 1826 to 1892.²

Surgery is not considered the first line of treatment, unless, of course, there are complications like perforation, bleeding and gastric outlet obstruction.³ Also, failed medical treatment which was an indication for surgical intervention had since been proven to be due to failure of eradication of *Helicobacter pylori* - a major cause of peptic ulcer disease.^{4,5}

The medical treatment over the years in the treatment of duodenal ulcer disease included antacids, anticholinergics, dietary control, sedatives, pepsin inhibitors, carbenoxolone sodium and radiation.⁶

The use of antibiotics for the eradication of *H. pylori* is currently the effective medical treatment for duodenal ulcer³ as *H. pylori* has been shown to be a major cause of duodenal ulcer and gastritis. It is also responsible for recurrence after medical treatment.

The purpose of this review paper is to re-visit the evolution of surgical procedures in the management of duodenal ulcer as a contribution to surgical history.

Historical Aspects

The initial surgical procedures for peptic ulcer were empirical. The first surgical procedure for duodenal ulcer was gastro-enterostomy - a procedure that was first described by Wolfler in 1881. Wolfler was a colleague of Billroth.⁷ Because of the associated high incidence of stomal ulcer after gastro-enterostomy, the procedure quickly went out of favour. In 1882, von Rydigier performed the first gastric resection for duodenal ulcer disease. This was a subtotal resection, and it involved the removal of about 66-75% of the stomach.⁸ This procedure was associated with a low recurrence rate and so replaced gastro-enterostomy as the

operation of choice for peptic ulcer. Even though the recurrence rate was low, there were major complications of dumping syndrome, and malnutrition. After some years, in an attempt to reduce the complication of malnutrition and the other complications of subtotal gastrectomy, Billroth 1 reconstruction was employed. But because Billroth 1 without the protection of vagotomy was associated with recurrence it also lost its appeal.⁹

Following the work of Dragstedt and Owens on gastric secretion,⁹ subtotal gastrectomy was abandoned for vagotomy. Initially, vagotomy alone was employed in an effort to control duodenal ulcer diathesis. Meanwhile, it was observed that the symptoms resulting from denervation of the stomach without drainage were most unpleasant to the patients. To overcome the gastric stasis following vagotomy without a drainage procedure, gastrojejunostomy was re-introduced. This again was associated with a high incidence of recurrence - much higher than anticipated. Thereafter, pyloroplasty was combined with truncal vagotomy, and the result of this combination was generally satisfactory.^{10,11}

Vagotomy and Pyloroplasty

Vagotomy and pyloroplasty is a popular surgical procedure for duodenal ulcer when surgery is indicated. Pyloroplasty could be one of these types: Heineke-Mikulicz, Weinberg, Finney or Jaboulay.¹² In Heineke-Mikulicz an incision is made on the distal stomach through the pylorus into the first part of the duodenum. This is then re-approximated horizontally leading to a disfunctioning of pyloric sphincter and a wider gastric drainage channel. Weinberg is similar but the suture is outside the lumen as opposed to Heineke-Mikulicz in which full thickness suturing is employed. Finney is a U-shaped 2-layer anastomosis between the stomach and the proximal duodenum while Jaboulay is essentially a side-to-side anastomosis between the stomach and the duodenum. All the various types of pyloroplasty are effective as the drainage procedures for the denervated stomach. Pyloroplasty has an advantage

over gastrojejunostomy because the duodenum is more resistant to gastric acid than the jejunum. Also the presence of chyme in the duodenum triggers a negative feed-back mechanism that controls gastric acid secretion. This feed-back mechanism is lost when the duodenum is bypassed in gastrojejunostomy, therefore predisposing the patient to stomal ulcer at the site of the anastomosis.

Vagotomy can be truncal, selective or highly selective. Truncal or total abdominal vagotomy is usually the simplest to perform and the most popular. Truncal or total vagotomy denervates not only the stomach but also the other organs supplied by the branches of the vagus nerves as they emerge from the oesophageal hiatus. Selective vagotomy or total gastric vagotomy preserves nerve branches to the liver, gallbladder and the celiac plexus but denervates only the stomach. Highly selective vagotomy, ultra selective vagotomy, parietal cell vagotomy or proximal gastric vagotomy all describe the same operation, which is the denervation of the stomach with preservation of the nerves of Latarjet supplying the pyloric antrum and the pylorus.¹² It can be done successfully in patients without the addition of a drainage procedure but it is technically more difficult. However, this is advisable only if the duodenal outlet is not scarred or obstructed. This procedure shows that the drainage problem encountered after truncal vagotomy is because of the absence of the nerves of Latarjet that supply the antrum of the stomach.

Vagotomy and Gastrojejunostomy

When gastrojejunostomy is to be performed, it should be performed at about 2.5cm proximal to the pylorus to avoid poor emptying of the stomach. The term "the most dependent part of the stomach" is variable and depends on the position of the patient at any particular time. A gastrojejunostomy could be antecolic, retrocolic, dependent, isoperistaltic and anti-peristaltic.¹²

Vagotomy and Hemigastrectomy

Vagotomy deals with the cephalic phase of gastric secretion while distal gastric resection eliminates the antral

phase of gastric secretion.¹² In subtotal gastrectomy about 60% of the stomach is removed¹⁰ but in antrectomy or limited distal gastrectomy about 25–40% of the stomach is removed.¹² The reconstruction may be either of Billroth I or Billroth II variety. Even though the complication of dumping syndrome may occur in both Billroth I and Billroth II operations, the later also causes iron deficiency anaemia and steatorrhoea. Should the mucosa of the pyloric antrum be retained in the duodenal stump at surgery, it leads to hypergastrinaemia and recurrence of peptic ulcers as the alkaline environment of the duodenum stimulates gastrin secretion. Billroth II procedure was introduced to eradicate the ulcer diathesis by the removal of the gastric antrum.¹¹ But it carries a high mortality rate; it is also associated with weight loss, reflux gastritis and dumping syndrome. In developing countries where nutritional problems are common, and where people ingest bulky food, any form of gastric resection for duodenal ulcer may not be advisable.

It should be noted that vagotomy has been performed for the relief of pain in some unresectable upper gastrointestinal neoplasms.¹³ In duodenal perforation the surgical procedure is tailored according to the condition of the patient.¹⁴

Subtotal Gastrectomy

The high mortality and morbidity associated with subtotal gastrectomy do not recommend the procedure in the treatment of duodenal ulcer, except in the uncommon cases where complete vagotomy proved impossible.¹¹

But in patients with gastric carcinoma, the various forms of gastric resection are acceptable.¹⁵

The discovery of *Helicobacter pylori* by Marshall and Warren has revolutionized the management of peptic ulcer disease.^{16–19}

Benign Gastric Ulcer

The medical treatment of benign gastric ulcer includes dietary control and the use of antacids, although the rationale is not quite clear. An earlier hypothesis on the aetiopathogenesis of gastric ulcer was that the ulcer developed

as a result of gastric retention which caused excessive antral secretion of gastrin leading to gastric hypersecretion.^{20,21} It is now known that the presence of *H. pylori* in the stomach is a major factor in the pathogenesis of gastric ulcer.⁵

Previously, the surgical treatment for gastric ulcer comprised of a combination of vagotomy, local excision of the ulcer and a drainage procedure such as pyloroplasty or gastrojejunostomy.²² Should surgery be indicated, laparoscopic distal partial gastric resection including the gastric ulcer with Billroth I or II anastomosis is the current choice. The extent of resection is indicated by the location and the extent of the gastric ulcer. In general, resection of more than 50 to 60 per cent of the stomach should be avoided.²² In cases where the ulcer is high on the lesser curvature, Hofmeister or Shoemaker modifications of Billroth II or Billroth I would allow for adequate resection of the ulcer while preserving adequate gastric remnant.²²

Zollinger-Ellison Syndrome

In 1955, Zollinger and Ellison²³ described a case of severe gastric hyperacidity associated with multiple severe ulcer diathesis. This is caused by a gastrin-producing neuroendocrine tumour usually located in the pancreas or in the wall of the duodenum.²⁴ The problem of this condition includes hyperacidity and possible metastatic potential of the tumour. The management of this disease has evolved over the years since it was first reported. The management evolved from aggressive gastric surgery to the use of drugs such as histamine antagonists and proton pump inhibitors.^{22,26} The argument against medical treatment alone is that even though the treatment controls hyperacidity, it does not affect the tumour progression and possible metastatic spread.^{27,28}

The suggestion now is that in selected patients with recurrent or persistent disease, resection of the gastrinomas is also indicated.²⁴

The Discovery of *Helicobacter pylori*

Up to the early 1980s, peptic ulcer disease was considered to be primarily

due to gastric acid secretion in the stomach and stress. But Barry Marshall, a clinical fellow at the time, and pathologist Robin Warren in Perth, Australia believed that there was an association between gastric inflammation and bacteria.²⁹ Warren had noticed small curved bacteria colonising the lower part of the stomach in about half of all the biopsies he examined with features of inflammation always close to the bacteria. These curvy bacteria had been noticed by other pathologists since the late 1800s, but thought to be contaminants since it was believed that no bacteria could colonise the stomach because of its acidity of gastric and the pumping action of the stomach.

Marshall cultured the bacteria, but unable to infect any animal models to show that the bacteria caused gastritis. Since he could not fulfill Koch's postulates using pigs, and facing skepticism from medical establishment he swallowed 10⁹ colony forming units of CLO in 10 ml of alkaline peptone water to infect himself¹⁶ and he developed severe gastritis. Even though this cleared up spontaneously, he still treated himself with antibiotics to eradicate any trace of the bacteria. For this discovery, Marshall and Warren received the 2005 Nobel Prize in Physiology Medicine.¹⁶

Not all those infected with *H. pylori* will develop illness; treatment may not be indicated for everyone with the bacteria as there is some evidence that the bacteria may show some benefits²⁹. Some studies have shown that esophageal reflux disease (Barrett's esophagus), esophageal cancer, asthma and other allergic disorders occur more frequently in people who are not infected with *H. pylori*.²⁹

Conclusion

The preferred, widely accepted surgical treatment of complicated duodenal ulcer is vagotomy and pyloroplasty but only when surgery is indicated. If gastrojejunostomy must be used instead of pyloroplasty, then it should be performed at a distance of about 2.5cm from the pylorus and not strictly at the most dependent part of the stomach. In cases of Zollinger-Ellison syndrome, the use of drugs, the resection

of the tumour and aggressive surgery for the target organ have been recommended.

For benign gastric ulcer, the surgical treatment is the resection of the distal stomach including the ulcer in the resection, but not taking more than 50–60% of the stomach.

In peptic ulcers associated with *H. pylori* colonisation of the stomach, the treatment is eradication of the bacteria from the stomach.

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