

Ulcer surgery and its complications

Historical and global perspective

This article will summarise the elective surgical procedures that were historically used for peptic ulcer disease and the consequences of such surgery. These procedures are now almost obsolete but there may some elderly patients who will have had such surgery.

It will also describe the indications for emergency surgery for peptic ulcers and the resulting morbidity and mortality.

Elective surgery for peptic ulcer disease has now 'virtually disappeared'. This is attributed to antacid medications, the treatment of [Helicobacter pylori](#), and an awareness of the gastric erosive effect of non-steroidal anti-inflammatory drugs (NSAIDs). However, the need for elective surgery was declining even before these treatments came about, which suggests a change in the natural history of peptic ulcer.

Nevertheless, there are some elderly patients still alive who have had elective surgery, so it is useful to know the effects of the procedures.

Furthermore, the rate of emergency surgery for peptic ulcer disease, although infrequent, has remained almost constant since the 1980s. The main indications for emergency surgery are haemorrhage and perforation. Stenosis with gastric outflow obstruction and potential malignant change are less common indications.

See also the separate articles on [Peptic Ulcer Disease](#) and [Upper Gastrointestinal Bleeding](#).

Indications for surgery

The options for malignant ulcers are discussed in the separate [Gastric Cancer](#) article.

Elective surgical procedures^[1] ^[2]

Various elective procedures for peptic ulceration have been assessed. The operations that have been used traditionally are:

- Billroth I gastrectomy.
- Billroth II or Pólya gastrectomy.
- Truncal vagotomy and pyloroplasty.
- Highly selective vagotomy.

Gastric ulcers were in the past best removed together with the gastrin-secreting zone of the antrum (achieved by the Billroth I gastrectomy).

Duodenal ulcers were treated either by removing the body and lesser curve of the stomach (where acid secretion mainly occurs) or by dividing the vagi. As this could interfere with gastric emptying, it was performed with either gastrojejunostomy or pyloroplasty. Gastrojejunostomy alone was used occasionally in elderly patients but this was often complicated by stomal ulcers. In theory this achieved ulcer healing by introducing alkali secretions from the jejunum. Partial gastrectomy with a gastrojejunal anastomosis is called a Pólya gastrectomy.

The partial gastrectomies are largely superseded by the vagotomy operations but many patients may be found who had such operations many years ago. Nowadays even operations to repair perforated ulcers are often performed laparoscopically and there may be a lower risk of immediate complications in low-risk patients.^[3] ^[4] Gastric resection can also be achieved laparoscopically.^[5]

Complications after elective stomach ulcer surgery^[6]

Complications can occur soon after surgery. Early complications usually occur whilst the patient is still in hospital and include wound infections, anastomotic leaks, or recurrence of bleeding.

Late complications vary according to the surgical procedure but they are generally more marked after partial gastrectomy than after vagotomy. Simple truncal vagotomy would lead to failure of gastric emptying and so a drainage procedure such as pyloroplasty is performed but this leads to poor control of gastric outflow. Highly selective vagotomy is supposed to overcome the problem in that it does not require a drainage procedure. It requires great skill to get enough denervation to heal the ulcer but not too much to cause delayed gastric emptying. Highly selective vagotomy has a much lower incidence of complications but a significantly higher incidence of recurrence.

Late complications after peptic ulcer surgery include:

- Recurrent ulceration.
- Diarrhoea.
- Dumping syndrome.
- Malabsorption and nutritional deficiencies – eg, [iron deficiency](#), [vitamin B12 deficiency](#), [folate deficiency](#).

Post-gastrectomy syndromes

The stomach transforms the intermittent intake of food into a more gradual release into the duodenum and small intestine as well as initiating the process of digestion. The control of gastric emptying is both neural and hormonal. The post-gastrectomy syndromes include:

- Small capacity or 'small stomach' syndrome – this is associated with fullness after only moderate-sized meals and may be associated with weight loss and reduced appetite.
- Dumping syndrome – can be early or late, as set out in more detail under the heading 'Dumping syndrome', below.
- Bile gastritis and bilious vomiting – can occur particularly after emptying of the afferent loop of a Pólya gastrectomy into the stomach remnant.

- Blind loop syndrome (sometimes called stasis syndrome or stagnant loop syndrome) - this affects digestion and absorption, causing:
 - Bloating, loss of appetite, abdominal pain and nausea.
 - Fatty stools (steatorrhoea).
 - Diarrhoea with weight loss.
 - Food unable to move through the bypassed section of bowel, producing a bacterial overgrowth syndrome. The bacteria may produce toxins as well as interfere with the absorption of nutrients.
- Anaemia usually results from iron deficiency from failure of iron absorption. It can also occur with loss of intrinsic factor and less B12 absorption (typically about two years after total gastrectomy).
- Steatorrhoea occurs particularly with a long afferent loop when fatty food is less well absorbed.
- Stomal ulceration may occur following gastrectomy for duodenal ulcer.
- Metabolic bone disease.

Post-vagotomy syndromes

Highly selective vagotomy aims to maintain the nerves of Latarjet (branches of the vagus nerve which supply the pyloric sphincter) and obviate the need for an accompanying drainage procedure (usually pyloroplasty). Complications afterwards include:

- Steatorrhoea and diarrhoea, which are common after vagotomy (although this is less of a problem after highly selective vagotomy). Often such symptoms are transient or episodic. However, in about 2% of cases symptoms are severe or persistent.
- Stomal ulceration, which can occur particularly if the vagotomy is incomplete.

Dumping syndrome ^[7]

This is the most troublesome of the syndromes after surgery to eradicate peptic ulcer. Dumping syndrome is a frequent complication of oesophageal, gastric or bariatric surgery.

There is rapid gastric emptying, with the delivery to the small intestine of a significant proportion of solid food as large particles that are difficult to digest. This causes excessive intravascular fluid to move to the intestinal lumen, which results in cardiovascular symptoms, release of several gastrointestinal and pancreatic hormones and late postprandial hypoglycemia.

Early dumping

Early dumping causes symptoms 30–60 minutes after a meal. Early dumping symptoms include both gastrointestinal and vasomotor symptoms. Symptoms include:

- Desire to lie down (with fatigue, faintness and possibly syncope).
- Palpitations.
- Headache.
- Flushing.
- Epigastric fullness.
- Nausea, vomiting and diarrhoea.
- Abdominal cramps and borborygmi (abdominal gurgling or rumbling sounds).

Late dumping

Late dumping occurs between one and three hours after a meal. Late dumping symptoms are the result of reactive hypoglycaemia. Symptoms include:

- Sweating and tremor.
 - Hunger.
 - Difficulty concentrating and even reduced level of consciousness.
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Malabsorption

Causes

Failure to absorb essential nutrients may be caused by a combination of factors:

- Poor dietary intake (as a result, for example, of bloating and decreased appetite).
- Intestinal hurry (with, for example, changes in the gut flora in blind loop syndromes).
- Reduced intrinsic factor (for example, after gastrectomy).
- Reduced acid secretion (after gastrectomy).

Presenting features

These may be vague and the onset is usually slow:

- Iron-deficiency anaemia may be accompanied by fatigue. FBC will show a microcytic, hypochromic anaemia and ferritin will be low.
- Folate deficiency will cause macrocytosis and macrocytic anaemia. Poor intake and blind loop syndromes are probably to blame for this common problem.
- Pernicious anaemia occurs after partial gastrectomy. Production of intrinsic factor is reduced (and hence absorption of B12). This produces a macrocytic anaemia.
- A mixed picture results from a combination of deficiencies in iron, B12 and folate.
- Chronic intake of an inadequate number of calories will cause weight loss and even muscle wasting.

Patients who have had such surgery need long-term follow-up with periodic weighing, FBC, ferritin, folate and B12 levels.

Stomach ulcer surgery recovery and management

- Small, frequent meals may enable an adequate intake of nutrients and reduce dumping syndrome. Avoid simple sugars and reduce fluid intake with meals.
- Iron and folic acid supplements may be required.
- Hydroxocobalamin injections to prevent vitamin B12 deficiency.

- Acarbose can reduce the absorption of glucose and help prevent late dumping but it may also aggravate bloating and diarrhoea.
- Octreotide is a somatostatin antagonist that can inhibit the release of insulin and various gut peptide hormones. Trials have shown benefit in severe dumping syndrome but it is not licensed for this purpose.
- A number of surgical reconstructions are possible of which the best known is the Roux-en-Y gastrojejunostomy. Symptoms may improve with time and so remedial surgery should not be undertaken without giving time.

Emergency surgical procedures

- Endoscopic haemostasis can be attempted in upper gastrointestinal haemorrhage where the patient is not compromised.
- If surgery is needed, an omental patch is usually stitched over the perforation (a Graham's omentopexy). This can be done laparoscopically or at laparotomy. Medical therapy for *H. pylori* eradication usually follows.^[8] ^[9] If the perforation is too large to be patched, a Roux-en-Y gastrojejunostomy or a subtotal gastrectomy may be needed.
- For small perforations that are difficult to localise, methylthioninium chloride (methylene blue) dye can be introduced via a nasogastric tube.^[10]

The 30-day mortality after surgery for perforated peptic ulcer, derived from data in the western world, varies between 10%,^[8] 16%^[11] and 29%.^[12]

Further reading

- [Dyspepsia - proven peptic ulcer](#); NICE CKS, July 2022 (UK access only)

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