Ivor–Lewis oesophagogastrectomy with Roux-en-Y duodenal bypass

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ABSTRACT

Oesophagectomies and gastrectomies are performed predominantly for the treatment of malignant disease. However, in this case series, we describe three patients with benign disease who had a laparoscopic oesophagogastrectomy with gastroduodenal detachment and Roux-en-Y biliary diversion, and discuss the operative feasibility and consequent patient outcomes. Our aim was to modify the procedure using an established reconstruction already practised in gastric and bariatric surgery, thereby preventing operative sequelae that lead to a poor quality of life (eg reflux oesophagitis and vomiting).

During the first postoperative year, our first two patients experienced weight loss, indigestion and lower bowel symptoms with no apparent improvement in gastric function compared with a standard gastric tube pull-up reconstruction. In the longer term, in both patients, the gastric tube interpositions appeared to function well and there was no evidence of gastro-oesophageal reflux disease, delayed gastric emptying or troublesome indigestion. Our third patient, who had lifelong severe reflux symptoms, was eating normally three months after the operation with no need for antacid medication. We therefore conclude that laparoscopic Ivor–Lewis oesophagogastrectomy with Roux-en-Y bypass is a more complex reconstruction with added risks but may in the long term result in better overall outcomes and satisfaction for patients, particularly those with benign disease.

KEYWORDS

Ivor–Lewis – Oesophagogastrectomy – Gastro-oesophageal reflux – Roux-en-Y bypass

Accepted 29 July 2015

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Oesophagectomies and gastrectomies are performed predominantly for the treatment of malignant disease. In these cases, the primary aim is to cure patients of their disease while the long-term quality of gastrointestinal function is of secondary importance. In contrast, when performing oesophagogastrectomy for benign disease, improved gastrointestinal function and overall patient wellbeing are usually the main concerns. It has been shown previously (perhaps unsurprisingly) that severity of physical symptoms following oesophagectomy correlate inversely with long-term quality of life.¹ As a result, the refinement of surgical techniques is paramount in decreasing patients' postoperative morbidity.

Many patients suffer a poor quality of life following oesophagogastrectomy.² The reason for this is often multifactorial. Surgical complications such as leaks and strictures can result in severe difficulties with eating, particularly diet limiting dysphagia leading to profound weight loss.³ Another important cause of reduced quality of life is malignant disease recurrence.⁴ Nevertheless, in some long-term survivors who have had an uncomplicated operation, quality of life is impaired by profound gastrointestinal symptoms such as vomiting and reflux, caused by the type of reconstruction used after their oesophagogastrectomy.⁵ Patients who have

had an oesophagectomy with gastric pull-up frequently suffer from severe reflux due to the acid secretion in the gastric conduit.⁶ Previous studies have shown that up to 35% of patients (at three years) will have oesophagitis, with some developing columnar metaplasia.⁷ This therefore has a huge impact when considering the long-term implications of oesophagectomy for those with benign conditions.

There have been multiple previous attempts to overcome acid reflux in oesophagectomy patients by modifying surgical techniques. These have included enhancing gastric emptying with pyloric drainage procedures and adding a modified fundoplication above the anastomosis. However, the desired results have not been forthcoming.⁸ Faced with three oesophagectomies to perform for benign disease and wanting not only optimal long-term function but also good quality of life, we decided to modify the standard gastric interposition procedure. A Roux-en-Y duodenal bypass was added to the gastric tube pull-up procedure, an established method of reconstruction in gastric and bariatric surgery. This report describes our three patients who had a laparoscopic oesophagogastrectomy with gastroduodenal detachment and Roux-en-Y biliary diversion. The operative feasibility and consequent patient outcomes are also discussed.

Case 1

A 45-year-old woman presented with a 10-year history of severe mid and upper oesophageal dysphagic symptoms, regurgitation and vomiting. Oesophageal manometry showed recurrent spasms of the distal oesophagus on swallowing with failed relaxation of the lower oesophageal sphincter. On repeated water swallows, the pressure in the oesophagus rose well above that of the stomach, creating a significant pressure gradient across the lower oesophageal sphincter, consistent with vigorous achalasia (Chicago type III). This was confirmed with barium swallows and endoscopy, which showed a dilated oesophagus often containing food residue.

The patient had been treated in the past by forceful balloon dilation of the lower oesophageal sphincter and botulinum toxin injections into the lower oesophagus with no improvement in symptoms. She had also previously undergone a laparoscopic Heller myotomy and further thoracoscopic long oesophageal myotomy without success. She had consequently come to the end of her tether and was unable to work owing to the severity of her symptoms. She was keen to be considered for an oesophagectomy. The risks and quality of life implications of an oesophagogastrrectomy with gastric pull-up were explained carefully. The option of an additional Roux-en-Y duodenal bypass was also discussed and the patient wished to be considered for this if it was deemed feasible intraoperatively.

A laparoscopic two-phase Ivor–Lewis oesophagectomy was performed as described previously (Fig 1).⁹ After mobilising the stomach and stapling the gastric tube, the duodenum was mobilised. A window was created behind the D1 segment while carefully preserving the right gastroepiploic and right gastric vessels. The D1 segment was divided with an Echelon™ 45mm linear stapler (Ethicon, Somerville, NJ, US) using a blue cartridge. A 60cm retrocolic Roux loop was created. The gastrojejunal and jejunojejunal anastomoses were stapled with a single fire by an Echelon™ 45mm linear stapler using a blue cartridge. The gastrojejunal anastomosis was stapled through the pylorus, thereby serving as a pyloroplasty. The jejunojejunal window was then closed. The patient was turned in the left lateral position for the right mini-thoracotomy, oesophagectomy and gastric tube pull-up. The oesophagogastric anastomosis was fashioned with a transoral OrVil™ 25mm circular stapler (Covidien, Dublin, Ireland).

The patient had an uncomplicated two-week hospital stay. After discharge, she was followed up at regular intervals as an outpatient. During the first postoperative year, she suffered with attacks of epigastric and left hypochondrial pain, which resulted in two hospital admissions for analgesia and further investigations (Fig 2). No cause for the pain was found. She also suffered temporarily from diarrhoea but this improved gradually with pancrelipase tablets, loperamide and input from a dietician. She initially lost 18% of her body weight following the procedure. However, by 18 months, she had minimal symptoms, was off all medication and was back to her preoperative weight. She was pleased with the outcome of the operation and had returned to work. A follow-up gastroscopy showed widely

Figure 1 On the left is shown the normal patient anatomy with planned sites of division at: a) the distal oesophagogastric junction, b) the proximal duodenum and c) the jejunum. On the right is shown the reconstruction with: d) the new gastrojejunal anastomosis and f) the jejunojejunal anastomosis providing drainage of the Roux limb. The biliary drainage comes from the loop of bowel marked 'e', the oversewn duodenal stump being at its proximal end.

Figure 2 Contrast swallow showing the rapid emptying of contrast from the gastric tube into a Roux loop of jejunum

patent oesophagogastric and gastrojejunal anastomoses with no evidence of oesophagitis or gastric food residue (Figs 3 and 4).

Case 2

A 52-year-old woman presented with dysphagia caused by a benign ectopic pancreatic intraductal papillary mucinous

Figure 3 Gastroscopy of the oesophagogastric anastomosis following the procedure, demonstrating the complete absence of oesophagitis and Barrett's metaplasia

Figure 4 Gastroscopy of the lower end of the gastric tube with gastrojejunostomy anastomosis

adenoma (36mm x 28mm) of the lower oesophagus, for which she was advised to have an oesophagectomy. Again, the risks and long-term quality of life implications of an oesophagogastric pull-up were discussed with the patient. The option of an additional Roux-en-Y duodenal bypass was also discussed and she wished to be considered for this if it was deemed feasible intraoperatively. A laparoscopic Ivor–Lewis oesophagogastric pull-up with Roux-en-Y duodenal bypass was performed in a similar fashion to that described for Case 1. The patient had an uncomplicated 17-day hospital stay. After discharge, she was followed up at regular intervals as an outpatient.

During the first postoperative year, the patient suffered with a lack of appetite and weight loss. She complained primarily of lower abdominal cramping with intermittent diarrhoea. She had no dysphagic symptoms but was nauseated frequently and did not tolerate sugar or cream-based foods. Her symptoms were improved with regular domperidone and pancrelipase tablets. Unfortunately, she contemporaneously developed Wegener's granulomatosis, which caused collapse of her nasal bridge and required her to commence immunosuppressive therapy, followed by nasal reconstructive surgery. By 18 months postoperatively, she had minimal digestive symptoms and was able to tolerate most foods. She had gained weight (back to preoperative weight) and a follow-up gastroscopy showed widely patent oesophagogastric and gastrojejunal anastomoses with no evidence of oesophagitis or gastric food residue.

Case 3

A 75-year-old man with a lifelong history of reflux symptoms developed tight benign oesophageal stricturing. After multiple balloon dilations provided only limited improvement in dysphagia, a partially covered metal stent was placed in his lower oesophagus. The intention was to remove the stent after six weeks. The stent unfortunately became embedded in the oesophagus with benign soft tissue ingrowth and colonisation with *Candida* at the proximal end. The requirement for dilations increased and the proximal end of the stent caused indentation of the left atrium.

The patient was referred for consideration of an oesophagectomy with the aims of resecting the stricture and removing the stent. The risks and long-term quality of life after an oesophagectomy were discussed with the patient. The option of an additional Roux-en-Y duodenal bypass was also discussed and the patient wished to be considered for this if it was deemed feasible intraoperatively. A laparoscopic Ivor–Lewis oesophagogastric pull-up with Roux-en-Y duodenal bypass was performed in a similar fashion to that described for the previous two cases.

Initially, the patient made good postoperative progress with full nasogastric feeding established on day 4. On day 8, he became acutely unwell with systemic sepsis and a distended abdomen. An emergency laparotomy revealed kinking at the jejunojunction, a distended Roux loop, leaking of enteric contents from the inferior gastric staple line and generalised peritonitis. Peritoneal washout was performed, the jejunojunction refashioned and the gastric staple line oversewn. The patient had a ten-week hospital stay including seven weeks on the intensive care unit that were characterised by sepsis, slow weaning from the ventilator, a tracheostomy, parenteral nutrition, a further leak from the gastric staple line treated conservatively, and computed tomography guided insertion of abdominal and chest drains. He was discharged home fully mobile, eating a normal diet and passing normal stools.

Discussion

Reconstruction after oesophagectomy by visceral (stomach, colon or small bowel) interposition is commonly fraught

with complications in the short term and frequently reduces quality of life significantly in the long term.¹ The main early mechanical complications of the visceral grafts are leaks, strictures and graft necrosis while the functional complications are delayed emptying and reflux.⁷

The early postoperative difficulties lead to significant in-hospital morbidity and mortality. However, the long-term consequences of these graft complications are also manifold, and include dysphagia, heartburn, regurgitation, choking, aspiration, vomiting, indigestion, sleep disturbance, lack of appetite, weight loss and lack of energy.¹⁰ These lead to poor gastrointestinal wellbeing and are also severely detrimental to overall quality of life.¹¹ The majority (60–80%) of patients who have had an oesophagectomy will have reflux symptoms following the procedure.⁸ Many of these will develop a chronic cough and recurrent pneumonia associated with the refluxing acid.¹² Importantly, patients can also go on to develop Barrett's oesophagus in their residual oesophageal stump.¹³ Naturally, these repercussions become particularly pertinent in patients who are not having an oesophagectomy for malignant disease and are otherwise well.

For technical rather than oncological reasons, a gastric tube pull-up procedure has become the most common visceral interposition after oesophagectomy or oesophagogastrrectomy.¹⁴ This is largely due to the relative simplicity of preparing a stomach, which remains attached to the duodenum and right gastroepiploic vessels, thereby requiring only one anastomosis.

It has been shown that a high oesophagogastric anastomosis and using a gastric tube rather than the whole stomach result in better function of the gastric conduit.¹⁵ This compares with preparing a segment of colon, which remains attached only to its mesocolonic blood supply and requires three anastomoses to complete the reconstruction. The downsides of the gastric tube pull-up are: 1) ischaemic complications at the tip, 2) lack of gastric length with resulting tension on the oesophagogastric anastomosis, 3) gastric denervation with pyloric spasm and delayed gastric emptying, 4) chronic gastro-oesophageal reflux of acid and bile with heartburn, regurgitation and vomiting, 5) indigestion and 6) a poor quality of life.

Csendes *et al* have shown that for selected patients with intractable gastro-oesophageal reflux symptoms, a planned distal gastrectomy with Roux-en-Y reconstruction results in significant resolution of symptoms.¹⁶ They suggest that the Roux loop should be at least 60cm and possibly 80cm long to prevent biliary reflux. Roux-en-Y reconstruction after gastric bypass for obesity is also sometimes employed to treat gastro-oesophageal reflux disease.¹⁷

After a distal gastrectomy, the simplest reconstruction is a single anastomosis (ie performing a gastroduodenostomy or gastro-loop jejunostomy [Billroth I and II]). Nevertheless, in the long term, Roux-en-Y reconstruction is associated with fewer problems with gastric emptying, biliary reflux and dumping symptoms, thereby improving quality of life.¹⁸ As a result, despite the increased complexity of two anastomoses and a duodenal stump, the Roux-en-Y duodenal bypass with

biliary diversion has become the preferred reconstruction after both partial and total gastrectomy. Adding a Roux-en-Y diversion, at a later date, to patients who are suffering from debilitating reflux following oesophagectomy has been shown to improve symptoms.¹⁹

Our three benign cases show that adding a Roux-en-Y duodenal bypass to the gastric tube pull-up reconstruction after an Ivor–Lewis oesophagectomy is not only feasible but can be achieved laparoscopically. Anecdotally, detaching the stomach from the duodenum appeared to give 3–5cm more length to the gastric tube and reduced tension in the tube, thereby facilitating the oesophagogastric anastomosis. On the other hand, the added procedure undoubtedly increases the complexity of the abdominal phase of the operation by adding two anastomoses as well as a duodenal stump and it also increases the risk of injury to the gastroepiploic blood vessels, which are vital to the survival of the stomach graft. Our third patient demonstrated the morbidity of Roux loop related complications that are added to the overall risks of an oesophagogastrrectomy.

During the first year after their Ivor–Lewis oesophagectomy with Roux-en-Y bypass, our first two patients experienced weight loss, indigestion and lower bowel symptoms with no apparent improvement in gastric function compared with a standard gastric tube pull-up reconstruction. In the longer term, however, in both patients, the gastric tube interpositions appeared to function well and there was no evidence of gastro-oesophageal reflux disease, delayed gastric emptying or troublesome indigestion. Our third patient, who had lifelong severe reflux symptoms, was eating normally three months after the operation with no need for antacid medication.

Our short case series shows that Ivor–Lewis oesophagectomy with Roux-en-Y duodenal bypass is feasible. The next step will be to make a valid assessment of the potential benefit versus the risks of the operation by carefully conducted prospective studies. A national database of high quality outcome data and selection of centres suitable to perform such operations will be mandatory, and a randomised controlled trial would be ideal. In this way, the relative safety of the operation in relation to the potential gain in long-term function and quality of life will be assessed for a selected group of patients with benign disease or curable malignancy.

Conclusions

Reconstruction after oesophagogastrrectomy needs to be safe, simple and associated with the best functional outcome. Gastric tube pull-up is a relatively safe and simple reconstruction but it can be associated with poor gastric function and poor quality of life due to gastro-oesophageal reflux, delayed gastric emptying and anastomotic strictures. An Ivor–Lewis oesophagogastrrectomy with a Roux-en-Y bypass is a more complex reconstruction with added risks but may in the long term result in better overall outcomes and satisfaction for patients, particularly those with benign disease.

Acknowledgement

The authors would like to thank Miss Cara Baker for the illustration of Figure 1.

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