Long-Term Follow-up of Patients with Roux-en-Y Gastrojejunostomy for Gastric Disease

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Objective
A consecutive series of Roux-en-Y gastrojejunostomies with a mean follow-up of 11.9 years was reviewed to characterize the long-term results of patients having this operation to treat or prevent bile reflux gastritis.

Summary Background
Development of postprandial abdominal discomfort, nausea, vomiting, or bezoar formation (Roux stasis syndrome) in the postoperative follow-up period has prompted questions about the role of Roux-en-Y gastrojejunostomy to treat or prevent bile reflux gastritis.

Methods
Long-term clinical follow-up (mean, 11.9 years) data for 24 patients was collected by reviewing medical records, interviewing patients directly through telephone contact, or both. All patients who had symptoms in the follow-up period were evaluated by upper gastrointestinal series, endoscopy, or both. A modified Visick scale was used for clinical ratings.

Results
Of the 22 evaluable patients, follow-up was complete in 20; the clinical condition that prompted surgery was corrected in 21 (95%). Roux-en-Y gastrojejunostomy was successful for treating or preventing bile reflux gastritis in all 22 patients. Despite this success, clinical failure (Visick scale III or IV) was documented in 8 patients (36%). Seven of the 8 patients had clinical failure within 6 months of operation, with the Roux stasis syndrome developing in 6 of them (27%).

Conclusion
This consecutive series of Roux-en-Y gastrojejunostomies performed by one surgeon has the longest follow-up to date. Although the Roux-en-Y gastrojejunostomy is safe and often successful, the procedure appears to be limited by a substantial rate of clinical dissatisfaction. Surgeons should be cautious in using it to treat primary or remedial gastrointestinal disease.

With increased use of fiber optic gastrointestinal endoscopy in the 1970s, a substantial number of postgastrectomy patients had gastritis associated with bile reflux. These patients comprised a group of postgastrectomy patients with pain and vomiting not explained by recurrent peptic ulcer disease, anastomatic obstruction, or afferent loop syndrome.

In 1897, Roux described a technique for diverting bil-
jejunal and pancreatic secretions to treat bilious vomiting. To alleviate the symptomatic reflux of biliary and pancreatic secretions into the stomach, Herrington used Roux’s technique of diversion in 27 patients and an iso-peristaltic segment of jejunum between the stomach and duodenum (Henley’s Loop) in 20 patients.2 His results were excellent to good in all patients. He believed that a remedial operation was indicated in carefully selected patients with characteristic symptoms, documented gastritis, and hypochlorhydria.

Motivated by these and other data, Roux-en-Y gastrojejunostomy was adopted enthusiastically to treat bile reflux gastritis in the late 1970s.3,4 Despite the absence of bilious vomiting in association with endoscopic and histologic improvement of gastritis, some patients who had Roux-en-Y diversion of biliary and pancreatic secretions began to have chronic abdominal pain, nausea, and vomiting that was worsened by eating.5,6 Mathias and colleagues7 found delayed gastric emptying using radiolabeled meal studies and showed abnormal motor function of a Roux limb by small bowel manometry in seven patients with these symptoms. In defining this Roux stasis syndrome, he suggested that the Roux limb acted as a functional obstruction and may have caused the symptoms of postprandial pain, nausea, and vomiting.

To characterize further the long-term results of patients having Roux-en-Y gastrojejunostomy, we collected follow-up data for 24 consecutive patients who had this procedure between 1976 and 1981.

### METHODS

From 1976 to 1981, one surgeon (J.C.M.) using the same operative technique, performed a Roux-en-Y gastrojejunostomy on 24 consecutive patients: 12 men and 12 women with a mean age of 50 years (range, 26 to 76 years).

Operative indications (Table 1) included postgastro-

| Table 1. INDICATIONS FOR ROUX-EN-Y GASTROJEJUNOSTOMY IN 24 PATIENTS |
|-----------------|-----------------|
| Bile reflux gastritis | 12 |
| Peptic ulcer disease | 6 |
| Revisional operative therapy | 6 |

tomy bile reflux gastritis in 12 patients. Eleven of these patients had a previous gastric resection for peptic ulcer disease. One patient had a previous vagotomy and pyloroplasty and therefore received an antrectomy in conjunction with the Roux-en-Y gastrojejunostomy. Although all 12 patients had Roux-en-Y gastrojejunostomy, concomitant procedures were performed in 4 patients and included vagotomy plus Nissen fundoplication (1), vagotomy plus Hill hiatal hernia repair (1), vagotomy alone (1), and cholecystectomy with intraoperative cholangiogram (1).

Roux-en-Y gastrojejunostomy was used to prevent bile reflux gastritis in conjunction with a primary vagotomy and antrectomy for peptic ulcer disease in six patients. One patient required an incidental splenectomy because of splenic damage that occurred during the gastrectomy.

Six patients had Roux-en-Y gastrojejunostomy as part of revisional operative therapy for mechanical postgastrectomy complications. Three of them were operated on for postgastrectomy anastomotic obstruction presumed to be due to recurrent peptic ulcer disease. One of these patients had not had a previous vagotomy so this was performed during the Roux-en-Y gastrojejunostomy in conjunction with a Nissen fundoplication performed for reflux esophagitis. Two of the six patients in this group were found to have jejunogastric intussusception by upper gastrointestinal series and endoscopy. One of these two patients had not had a previous vagotomy so this was performed in conjunction with the Roux-en-Y gastrojejunostomy. In addition, this same patient also had reflux esophagitis so a Nissen fundoplication was performed. The remaining operative revision in this group was performed after resection of a benign gastrojejunal fistula caused by recurrent peptic ulcer disease.

Endotracheal anesthesia and a standard midline laparotomy incision were used for all patients. The gastrojejunostomy was performed using gastrointestinal stapling devices and buttressing sutures of 4-0 silk at anastomotic angles. The jejunal anastomosis was placed 40 cm distal to the gastrojejunal anastomosis in all cases and also was performed using gastrointestinal staples and buttressing 4-0 silk sutures at anastomotic angles (Fig. 1). In those patients who had revisional operation after a previous loop gastrojejunostomy (16), the gastrojejunostomy was left intact and the afferent loop was divided by a gastrointestinal stapling device and placed 40 cm distal to the gastrojejunostomy, as previously described (Fig. 2).

Follow-up of these patients was completed by reviewing medical records, by interviewing them through direct telephone contact, or both. All of the patients who had symptoms in the follow-up period were evaluated by upper gastrointestinal series, endoscopy, or both to rule out
recurrent peptic ulcer disease, stomal stenosis, or mechanical obstruction. Clinical results were graded according to a modified Visick scale (Table 2).  

RESULTS

No operative deaths or major postoperative complications occurred. The clinical follow-up is complete and current in 20 patients (83%), with a mean follow-up of 11.9 years (0.5 to 16.5 years). Only two patients have been completely lost to follow-up. Follow-up is incomplete in two other patients because one was lost after 5 months and the other after 12 months.

None of the 22 evaluable patients died during the immediate postoperative period. Seven patients died later, 13 patients are alive, and 4 are lost to follow-up. Symptomatic improvement (Visick scale I to II) occurred in 14 patients (64%) whereas clinical failure (Visick scale III to IV) was documented in 8 patients (36%) (Table 3).

Two of the 8 failures were graded Visick III because of postvagotomy diarrhea (1) and gastroesophageal reflux (1). The procedure failed in the remaining 6 patients (27%), as manifested by the Roux stasis syndrome. Bezoars developed in 2 patients and the remaining 4 had substantial abdominal discomfort associated with nausea and vomiting and aggravated by food. The Roux stasis syndrome occurred within 6 months of operation in 5 of 6 patients.

<table>
<thead>
<tr>
<th>Table 2. VISICK GRADES</th>
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<tr>
<td>Visick I</td>
</tr>
<tr>
<td>Visick II</td>
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<tr>
<td>Visick III</td>
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<td>Visick IV</td>
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Figure 1. Roux-en-Y gastrojejunostomy after gastrectomy.

Figure 2. Roux-en-Y gastrojejunostomy after revision of loop gastrojejunostomy.
Of the 12 patients operated on for bile reflux gastritis, 2 were completely lost to follow-up. One patient had incomplete follow-up but showed symptoms of the Roux stasis syndrome with exclusion of other gastrointestinal disease by upper gastrointestinal series and endoscopy before being lost 12 months after operation. Two other patients experienced postprandial abdominal discomfort, nausea, and vomiting and were thought to have Roux stasis syndrome. Clinical dissatisfaction (Visick III to IV) occurred in two other patients in this group because of persistent postoperative abdominal pain in one and severe postvagotomy diarrhea in the other. Thus, of the 10 evaluable cases, only 5 patients had no postoperative symptoms. Of these 5 asymptomatic patients, 3 had no further studies because they were doing well; 1 had a normal result of postoperative upper gastrointestinal series, and another, who died of an unrelated medical problem, had resolution of gastritis confirmed by autopsy. The 5 patients who continued to have gastrointestinal symptoms were evaluated extensively by radiographic and endoscopic procedures and no evidence of bile reflux gastritis was found.

Follow-up was complete in all 6 patients who had a Roux-en-Y gastrojejunostomy as the anastomotic technique after vagotomy and antrectomy for peptic ulcer disease. A recurrent anastomotic ulcer developed in 1 patient 5 years after operation and was confirmed by postoperative endoscopy. Completeness of the vagotomy in this patient had been confirmed pathologically and the recurrent ulcer was treated medically with a good result. The roux-en-Y gastrojejunostomy failed in 1 patient as shown by development of the Roux stasis syndrome.

The underlying problem was cured in the six patients who had construction of a Roux-en-Y gastrojejunostomy as part of their revisional operative therapy for mechanical postgastrectomy problems. However follow-up was incomplete in one patient and one patient had a late mechanical obstruction of the Roux limb requiring reoperation and lysis of adhesions 15 months after operation. Symptoms of the Roux stasis syndrome developed in two of the remaining four patients and thus the procedure was considered to have failed.

### Table 3. CLINICAL RESPONSE OF ROUX-EN-Y GASTROJEJUNOSTOMY IN 22 PATIENTS

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<tr>
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<th>Visick I-II</th>
<th>Visick III-IV</th>
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<tbody>
<tr>
<td>Bile reflux gastritis</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Peptic ulcer disease</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Revisional operative therapy</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>14 (64%)</td>
<td>8 (36%)</td>
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**DISCUSSION**

Toye and Williams suggested in 1965 that reflux of intestinal contents into a gastric pouch after gastrectomy may cause a bilious vomiting syndrome. Subsequently, du Plessis documented the injurious effects of duodenal reflux on the gastric mucosa. van Heerden and associates at the Mayo Clinic described a clinical syndrome of postoperative reflux gastritis and recommended diversion of the intestinal contents away from the gastric mucosa; they achieved the most success using a Roux-en-Y jejunal limb. Several other clinical series have reported good to excellent results in managing postoperative reflux gastritis by Roux-en-Y gastrojejunostomy. Similar results were achieved in our series with no recurrence of bilious vomiting.

Because of the success of biliary diversion by a Roux-en-Y gastrojejunostomy to treat postoperative bile reflux gastritis, using this technique in the anastomosis after vagotomy and antrectomy was thought reasonable to treat peptic ulcer disease and to prevent bile reflux gastritis. It also seemed logical to use the same technique in revisional gastric operations for mechanical postgastrectomy complications. Of all the patients in this series who had a Roux-en-Y gastrojejunostomy to prevent bile reflux gastritis (12), none had bilious vomiting, bile reflux gastritis, or both.

However, in 1985, Mathias and colleagues defined a syndrome of chronic abdominal pain, nausea, and vomiting that was worsened with the intake of food in some patients who had a Roux-en-Y gastrojejunostomy (Roux stasis syndrome). They studied seven patients using radiolabeled solid meals to assess gastric emptying. Small bowel manometry was also used to evaluate these patients. All showed delayed gastric emptying and abnormal function of the Roux limb during the fasting state. They suggested that the Roux limb acted as a functional obstruction and may have caused the clinical symptoms.

Van der Mijle and coworkers further characterized this syndrome in a larger group of patients who had Roux-en-Y gastrojejunostomy. Gastric emptying and Roux limb transit were studied using a radionuclide test, and motility disorders of the Roux limb were evaluated further by manometry. They suggested that the Roux stasis syndrome had a shared origin, with some patients experiencing delayed gastric emptying related to vagotomy and others having disorders in the Roux limb transit secondary to motility abnormalities. In addition, Miedema and Kelly found that separation of the Roux limb from the duodenal pacemaker by jejunal transection allowed ectopic pacemakers to arise in the Roux limb and drive contractions oral.

In contrast, Mathias and associates found normal motor activity of the Roux limb in patients having re-
Table 4. FOLLOW-UP OF ROUX-EN-Y GASTROJEJUNOSTOMY IN 22 PATIENTS

<table>
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<tr>
<th>“Roux Syndrome”</th>
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<tr>
<td>Bile reflux gastritis</td>
<td>144</td>
<td>3/10</td>
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<tr>
<td>(12 yrs)</td>
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<td></td>
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<tr>
<td>Peptic ulcer disease</td>
<td>133</td>
<td>1/6</td>
</tr>
<tr>
<td>(11.1 yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revisional operative therapy</td>
<td>152</td>
<td>2/6</td>
</tr>
<tr>
<td>(12.6 yrs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>143</td>
<td>6/22</td>
</tr>
<tr>
<td>(11.9 yrs)</td>
<td></td>
<td>(27%)</td>
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construction after total gastrectomy to treat Zollinger-Ellison syndrome. Similarly, Britton and associates noted that a Roux-en-Y gastrojejunostomy used to treat primary peptic ulcer disease is not associated with the same morbidity as a Roux-en-Y gastrojejunostomy used for revisional gastric surgery. Symptoms were equated with the Roux stasis syndrome in only 1 of our 6 patients who had prophylactic Roux-en-Y gastrojejunostomy after vagotomy and antrectomy to treat peptic ulcer disease. Despite these reports and clinical observations, caution is still advised in using Roux-en-Y gastrojejunostomy to prevent bile reflux gastritis and to treat peptic ulcer disease. Kerrigan and colleagues reported abnormal intestinal motility in patients with active peptic ulcer disease and noted its persistence even after the ulcer had healed. This underlying motility disorder may be exacerbated by vagotomy, transection of the jejunum, or both.

This series confirms the effectiveness of a Roux-en-Y gastrojejunostomy used to treat or prevent bile reflux gastritis. Clinical success was achieved in 16 of 16 of our patients for whom treatment or prevention of bile reflux gastritis was an operative indication. However, substantial gastrointestinal symptoms and clinical dissatisfaction occurred after the Roux-en-Y gastrojejunostomy (36%) was performed. Seven of our eight clinical failures (Visick scale III to IV) occurred within 6 months of operation. Six of these patients had symptoms of the Roux stasis syndrome (27%) (Table 4).

Although Roux-en-Y gastrojejunostomy is safe and often successful, its use appears limited by a substantial rate of clinical dissatisfaction and surgeons should use it cautiously to treat primary or remedial gastrointestinal disease.

Acknowledgments

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References


Discussion

DR. JOHN L. SAWYERS (Nashville, Tennessee): Dr. McAlhany reports his personal experience with Roux-en-Y gastrojejunostomy with a mean follow-up to 12 years. I was especially interested in the ten patients who had a Roux-en-Y gastrojejunostomy for alkaline reflux gastritis with this follow-up. Three of the ten developed the Roux syndrome and five of ten had less than a satisfactory result by the Visick scale. This differs somewhat from Dr. Herrington’s and my results. If we could have that slide, please. We reported our experience with Roux-en-Y gastrojejunostomy for alkaline reflux gastritis this year in Problems in General Surgery, guest edited by Dr. Gerald