Roux-en-Y Near Esophagojejunostomy for Failed Antireflux Operations: Outcomes in More Than 100 Patients

Omar Awais, DO, James D. Luketich, MD, Neha Reddy, MD, Valentino Bianco, DO, MPH, Ryan M. Levy, MD, Matthew J. Schuchert, MD, William E. Gooding, MS, Lawrence R. Crist, DO, Rodney J. Landreneau, MD, and Arjun Pennathur, MD

Division of Thoracic and Foregut Surgery, Department of Cardiothoracic Surgery, University of Pittsburgh Medical Center, Pittsburgh; and The University of Pittsburgh Cancer Institute Biostatistics Facility, Pittsburgh, Pennsylvania

Background. Intractable gastroesophageal reflux disease (GERD) after antireflux operations presents a challenge—particularly in obese patients and patients with esophageal dysmotility—and increases the complexity of the redo operation. This study evaluated the results of Roux-en-Y near esophagojejunostomy (RNY-NEJ) in the management of recurrent GERD after antireflux operations.

Methods. We conducted a retrospective review of overweight patients with intractable GERD who underwent RNY-NEJ for failed antireflux operations. We evaluated perioperative outcomes, dysphagia (ranging from 1 = no dysphagia to 5 = unable to swallow saliva), and quality of life (QOL) (assessed using the GERD health-related quality-of-life instrument (HRQOL).

Results. Over a 12-year period, 105 patients with body mass index (BMI) greater than 25 underwent RNY-NEJ for failed antireflux operations. Most were obese (BMI > 30; 82 patients [78%]); esophageal dysmotility was demonstrated in more than one-third of patients. Forty-eight (46%) patients had multiple antireflux operations before RNY-NEJ, and 27 patients had undergone a previous Collis gastroplasty. There was no perioperative mortality. Major complications, including anastomotic leak requiring surgical intervention (n = 3 [2.9%]), were noted in 25 patients (24%). The median length of stay was 6 days. During follow-up (mean, 23.39 months), median BMI decreased from 35 to 27.6 (p < 0.0001), and the mean dysphagia score decreased from 2.9 to 1.5 (p < 0.0001). The median GERD HRQOL score, assessed in a subset of patients, was 9 (classified as excellent).

Conclusions. RNY-NEJ for persistent GERD after antireflux operations in appropriately selected patients can be performed safely with good results in experienced centers. RNY-NEJ should be considered an important option for the treatment of intractable recurrent symptoms after antireflux operations, particularly in obese patients.

undergo Roux-en-Y (RNY) bypass may experience significant weight loss, which was associated with an improvement in reflux symptoms in more than 80% of patients [15, 16]. Considering the failure rates of redo antireflux operations, the increased incidence of obesity, and the correlation of obesity with GERD, RNY near esophagojejunostomy (RNYNEJ) may provide an attractive option in obese patients with recurrent intractable symptoms after previous fundoplication.

We have previously reported on the feasibility of RNYNEJ after failed antireflux operations [17]. Our primary objective in the current study was to evaluate the outcomes after RNYNEJ for the management of refractory reflux symptoms after antireflux operations in overweight patients in a large series of patients.

Patients and Methods
We retrospectively reviewed our experience with RNYNEJ after failed antireflux operations in overweight patients with a body mass index (BMI) greater than 25 at the University of Pittsburgh Medical Center over a 12-year period from June 2000 to April 2012. This retrospective study included a follow-up of our original series [17] and was approved by our institutional review board. Since this was a retrospective study, the individual patient consent requirement was waived.

Preoperative Evaluation and Investigations
Patients who were candidates for RNYNEJ underwent a comprehensive evaluation, with a complete history and physical examination. Investigations included barium esophagography, esophagogastroduodenoscopy, esophageal manometry, pH testing, and gastric-emptying studies. In addition, the details of the previous operative procedure were reviewed before the reoperation. Data were collected on preoperative variables including sex, age, symptoms, BMI, number of previous antireflux procedures, and history of a previous Collis gastroplasty. Dysphagia scores were assessed preoperatively and postoperatively (Table 1).

Surgical Technique
Our surgical approach has been described in detail previously [17]. In brief, preoperative on-table endoscopy was performed in all patients. The initial operative approach was laparoscopic in 81 patients (77.2% [81 of 105]); we converted this to an open procedure in 24 patients (22.9% [24 of 105]). Extensive lysis of adhesions was followed by takedown of the fundoplication and complete hiatal mobilization to restore normal anatomy and allow for identification of the gastroesophageal (GE) junction. This was done after removal of the GE fat pad. Intraoperative assessment was performed to evaluate the integrity of the cardia, fundus, and both vagus nerves. The integrity of the esophagus and gastric cardia was assessed both endoscopically and laparoscopically after the fundoplication was completely taken down and normal anatomy was established. Next, after a leak test by insufflation of air, a small gastric pouch consisting of only cardia was constructed. This was followed by the creation of a 75-cm Roux limb, which was delivered in a retrogastric and retrocolic fashion to construct the proximal anastomosis. All the potential defects were closed. The RNYNEJ is a modification of the gastric bypass performed by bariatric surgeons, with the gastric pouch limited to essentially a cuff of stomach beyond the esophagus to eliminate any acid production and a much shorter Roux limb. In some patients (n=11), the cardia was not suitable for anastomosis, and an esophagojejunostomy was performed. At the conclusion of the procedure, a gastrostomy tube and a Jackson-Pratt drain were placed (Fig 1). Pyloroplasty was not performed in our patients. A postoperative barium swallow was performed on either postoperative day 2 or 3.

Table 1. Dysphagia Score Scale

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>no dysphagia</td>
</tr>
<tr>
<td>2</td>
<td>unable to swallow hard solids</td>
</tr>
<tr>
<td>3</td>
<td>unable to swallow soft solids</td>
</tr>
<tr>
<td>4</td>
<td>unable to swallow liquids</td>
</tr>
<tr>
<td>5</td>
<td>unable to swallow saliva</td>
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Fig 1. Roux-en-Y near esophagojejunostomy (RNYNEJ). This is typically performed with a laparoscopic approach in a retrocolic and retrogastric fashion. A gastrostomy tube is placed to drain the remaining stomach. Inset shows esophagojejunal anastomosis. (Reprinted from Awais O, et al, Ann Thorac Surg 2008;85:1954-9 [17], with permission from Elsevier.)
Postoperative Follow-Up

On discharge, all patients were placed on lifelong oral multivitamins and intramuscular B12 injections. Symptoms, postoperative weight loss, and comorbid medical conditions were evaluated during follow-up visits every 3 months for the first year and then yearly after that. In addition, laboratory investigations were ordered every 6 months to assess for malabsorption. We assessed quality of life (QOL) by administering the GERD Health-Related Quality of Life (HRQOL) questionnaire, which was given to the patients to complete. The GERD HRQOL questionnaire is a disease-specific instrument consisting of questions related to GERD, with a best possible score (no symptoms) of 0 and a worst possible score (most severe symptoms) of 50 [18]. We classified HRQOL scores as excellent (0–9), satisfactory (10–15), or poor (16–50) [19].

Statistical Design and Analysis

The outcome variables evaluated included improvement in symptoms, failure requiring reoperation, and QOL after redo surgery. Statistical comparison of preoperative and postoperative BMI was calculated with a paired Student’s t test. Postoperative clinical symptoms were compared with the patient’s preoperative complaints using McNemar’s χ² test for differences in proportions of paired outcomes. An exact 2-sided Jonckheere-Terpstra test was used to evaluate trend in association of variables. Kaplan-Meier plots were constructed using Greenwood confidence limits for estimation of failure-free survival. Comparison of paired dysphagia scores was done using the signed rank test.

Results

Patient Characteristics

A total of 105 patients underwent RNYNEJ after failed fundoplication. Patient characteristics are summarized in Table 2. The median patient age was 55 years (range, 23–80 years); there were 23 (22% [23 of 105]) men and 82 (78% [82 of 105]) women. Forty-eight patients (46% [48 of 105]) patients had undergone 2 or more previous antireflux operations. In the group that had undergone multiple previous redo operations, the median number of previous redo operations was 2 (range, 2–4). The most common presenting symptoms were heartburn in 70% (73 of 105), regurgitation in 70% (73 of 105), and dysphagia in 51% (54 of 105) of patients.

A preoperative upper endoscopy and contrast swallow evaluation were performed in all patients. Endoscopic assessment revealed esophagitis in 22 of 105 (21%), Barrett’s esophagus in 11 of 105 (10.5%), and low-grade dysplasia in one patient (1.0%). None of these patients had an esophageal stricture as a cause of their dysphagia; this was confirmed on preoperative endoscopy and a barium study. Manometry with or without pH testing was obtained in 65% (68 of 105) of patients. Manometry was abnormal in 43% (45 of 105) of patients. Severe dysmotility documented by preoperative manometry was noted in 70% of patients with dysmotility. Manometry and pH testing were not performed when a clear anatomic defect was noted on barium contrast swallow or upper endoscopic examination. Gastric emptying studies were obtained selectively (51 of 105 patients [49%]).

Seven of the 105 patients had mesh used at the previous operation, and in 2 of these 7 patients the mesh had eroded into the lumen. All of these patients underwent conversion to an RNY bypass, and the majority underwent an esophageojunostomy.

Perioperative Outcomes

The median length of hospital stay was 6 days. There was no perioperative mortality. Major complications were experienced by 22 patients (21% [22 of 105]). Anastomotic leaks occurred in 11 patients (10% [11 of 105]); only 3 patients (2.9% [3 of 105]) with leaks were managed with operative intervention. The other patients with leaks were managed with endoscopic assessment and drain manipulation. A previous Collis procedure did not have an impact on the leak rate. The subgroup of patients with a previous Collis gastroplasty had a leak rate of 7% compared with an overall leak rate of 10%, and this was not significantly different. Similarly, there was no increase in leak rates with increasing number of previous fundoplications (exact 2-sided Jonckheere-Terpstra test for trend p = 0.8693). The perioperative morbidity and mortality are summarized in Table 3.

Improvement in Symptoms

Routine clinical follow-up was complete in all patients. Heartburn, regurgitation, dysphagia, and pulmonary

Table 2. Patient Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%)</th>
<th>Unless Specified</th>
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<tbody>
<tr>
<td>Total patients</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>23</td>
<td>23 (22%)</td>
</tr>
<tr>
<td>Female</td>
<td>82</td>
<td>82 (78%)</td>
</tr>
<tr>
<td>Age (median)</td>
<td>55 y</td>
<td>(range: 23–80 y)</td>
</tr>
<tr>
<td>Single previous antireflux operation</td>
<td>57</td>
<td>(54%)</td>
</tr>
<tr>
<td>Multiple previous antireflux operations</td>
<td>48</td>
<td>(46%)</td>
</tr>
<tr>
<td>Previous Collis gastroplasty</td>
<td>27</td>
<td>(26%)</td>
</tr>
<tr>
<td>BMI &gt; 25</td>
<td>105</td>
<td>(100%)</td>
</tr>
<tr>
<td>BMI &gt; 30</td>
<td>82</td>
<td>(78%)</td>
</tr>
</tbody>
</table>

BMI = body mass index.

Table 3. Perioperative Morbidity and Mortality

<table>
<thead>
<tr>
<th>Complication</th>
<th>N (%)</th>
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<tbody>
<tr>
<td>Mortality</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Any major complication</td>
<td>25 (24)</td>
</tr>
<tr>
<td>Leak</td>
<td>11 (10.5%)</td>
</tr>
<tr>
<td>Roux-limb obstruction</td>
<td>2 (1.9%)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>6 (5.7%)</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>4 (3.8%)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>ARDS</td>
<td>1 (1%)</td>
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</table>

*Leaks requiring surgical intervention occurred in 3 patients (2.9%).

ARDS = acute respiratory distress syndrome.
symptoms improved significantly after RNYNEJ ($p < 0.0001$) (Fig 2). Paired dysphagia scores were obtained in all patients who had preoperative dysphagia ($n = 54$). There was a significant decrease in dysphagia after RNYNEJ, and the mean dysphagia score decreased from 2.9 before RNYNEJ to 1.5 after RNYNEJ (signed rank test $p < 0.0001$) (Fig 3). During follow-up (median, 14 months; mean, 23.39 months), median BMI decreased significantly from 35 before RNYNEJ to 27.6 after RNYNEJ ($p < 0.0001$). Detailed follow-up with QOL questionnaires was available in a subset of patients (44%; 46/105). During follow-up, the median GERD HRQOL score postoperatively was 9 (classified as excellent) (range, 0–48), indicating preserved GERD HRQOL in most patients. We noted a resolution or improvement in comorbidities: hypertension (68%), sleep apnea (73%), and diabetes (100%). Fourteen patients were receiving proton-pump inhibitors postoperatively, however, the need for proton-pump inhibitors was unclear without an objective pH study. At the most recent endoscopy, only 2 of 105 patients had esophagitis. Endoscopy was available in 6 of 11 patients with Barrett’s esophagus. In 3 of 11 patients, complete regression of Barrett’s esophagus was noted, and in an additional 3 patients no progression was seen. One patient had preoperative low-grade dysplasia that had resolved on postoperative endoscopy.

Failure of the RNYNEJ Operation
During follow-up of up to 135 months (mean follow-up, 23.39 months; interquartile range, 4.6–31.09 months), 5 patients (5%) had failure of the RNYNEJ redo operation, defined as need for reoperation at the diaphragmatic hiatus, with repair of a recurrent hiatal hernia. The 5 failures occurred 1.8, 2.25, 2.65, 4.84, and 6.23 years after RNYNEJ. A primary suture repair of the hiatus was performed in all 5 patients. The primary repair was reinforced with an onlay biological mesh in 2 of the 5 patients because of loss of crural integrity. The estimated probability of failure-free survival in these patients was 100% at 1 year, 98% (95% confidence interval [CI], 93%–100%) at 2 years and 91% (95% CI, 82%–100%) at 3 years (Fig 4).

Comment
In this largest series to date, we present the outcomes of more than 100 patients with BMIs greater than 25 who underwent RNYNEJ after failed antireflux operations. In this series, nearly 80% of patients were obese with BMIs greater than 30; there was no perioperative mortality and postoperative morbidity was acceptable. Even when performed by experienced surgeons, the success rate for reoperative antireflux procedures does not match that of a primary fundoplication [8, 19–22]. Intractable gastroesophageal reflux symptoms after antireflux operations, particularly in obese patients and patients with esophageal dysmotility, present a challenging problem and add to the complexities of the redo operation. One of the factors that may lead to failure of a previous fundoplication is obesity.
RNY diversion of acid and bile from the esophagus has the potential to address not only recurrent reflux symptoms after failed fundoplication but also obesity. We previously demonstrated that RNYNEJ is feasible after failed antireflux operations and can effectively control GERD symptoms, with the added benefits of weight loss and improvement of comorbidities [17].

The patients in this series were a complex group of patients, as indicated by the fact that 46% of them had undergone 2 or more previous antireflux procedures, 26% had undergone a previous Collis gastroplasty, 43% exhibited esophageal dysmotility, and 78% were obese (BMI > 30). Despite the complexity in these patients who had refractory GERD symptoms after previous antireflux operations, we noted significant improvements in heartburn, regurgitation, and dysphagia after RNYNEJ. This improvement is likely because of complete acid and bile diversion.

The surgical options after a failed fundoplication include redo fundoplication and RNY diversion (which both preserve the esophagus) and resection/esophagectomy. Although esophagectomy is perhaps a viable option in patients who present with Barrett’s esophagus with high-grade dysplasia or long esophageal stricture after failed antireflux operations, an esophagectomy can eventually lead to recurrent reflux. The incidence of reflux after esophagectomy, typically performed with a gastric conduit, has been reported to be as high as 60% to 80% [23], and others have used RNY diversion for intractable duodenogastric reflux after esophagectomy [24]. Considering the high incidence of recurrent reflux after esophagectomy, the reduced likelihood of successful symptom resolution after multiple redo fundoplications, and the potential improvement of GERD symptoms after RNY diversion, RNYNEJ is emerging as an attractive surgical option, especially in the obese patient population with failed antireflux operations.

Deschamps and colleagues [25] reported a 35-year reoperative antireflux experience in 1997, in which 9.2% of patients underwent RNY diversion when the fundus was not suitable for fundoplication. We previously reported conversion to RNYNEJ after failed antireflux operations in 13.7% of patients over a 5-year period [17]. Most recently, Stefanidis and colleagues [26] reported that 27.7% of failed antireflux procedures were converted to RNY reconstruction. This trend of an increasing percentage of patients undergoing RNY diversion may be, in part, caused by the rise in obesity in the Western world over the past 20 years and the potential effectiveness of RNY bypass as an antireflux operation.

Patients with intractable recurrent symptoms after antireflux operations present a challenge even for experienced esophageal surgeons; therefore, the evaluation of these patients before another operation attempting to resolve their symptoms should be thorough and complete. The evaluation typically includes a detailed history and evaluation of the patient’s symptoms, review of all previous operative records, indications for previous operations, and objective tests with documentation of current BMI and comorbidities. An upper endoscopy and a barium esophagram are necessary in all patients.

Esophageal physiology testing, such as manometry, pH monitoring, and gastric-emptying studies, can be performed selectively to make an informed decision regarding selection of the operation. Some investigators have attempted to examine the variables associated with improved outcomes after RNY reconstruction [27]. At present, we use an individualized approach for selection of the operation in these complex patients after failed antireflux operations. Once our evaluation has been completed, we consider various factors when offering a patient RNYNEJ. These include increased BMI and the severity of the patient’s GERD symptoms, including heartburn, as well as anatomic abnormalities, esophageal motor function, obstructive symptoms of dysphagia and regurgitation, delayed gastric emptying, the number of previous operations, and obesity-related comorbidities [17, 28]. These variables need to be evaluated further in order to define optimal candidates and further work is required for optimizing patient selection.

The effectiveness of RNY bypass as an antireflux operation because of acid and bile diversion after a failed fundoplication has been studied since the mid-1980s [29, 30]. RNYNEJ may also be considered when the integrity of the gastroesophageal junction does not allow the construction of a fundoplication in a redo setting [25]. Obesity correlates with GERD [9], and it is estimated that the incidence of GERD in obese patients may be as high as 61% [27]. With the epidemic of obesity in the Western world, surgical weight reduction has become an attractive option in selected patients, and investigators have demonstrated an 80% improvement in reflux symptoms after weight reduction operations, associated with weight loss [16]. Other single-institution studies have reported excellent control of reflux after conversion of failed fundoplication to RNY bypass. Kellogg and associates [13] reviewed outcomes in 11 patients and noted improvement in GERD symptoms in all patients (100%) and complete resolution of symptoms in 78%. In another series, which included 19 patients, Houghton reported that 94% had better control of their reflux symptoms after RNY reconstruction [13, 31]. In a recent report of 22 patients who underwent RNY reconstruction for failed fundoplication, Makris and associates [32] reported very low GERD symptom severity scores after operation.

Dysphagia may be a difficult symptom to manage after previous antireflux operations and its cause can be multifactorial. It can be related to several factors, including anatomic abnormalities such as recurrent hernia, abnormalities of the fundoplication, hiatal closure, or esophageal motor dysfunction [33]. Dysphagia may persist even after esophagectomy. Chang and coworkers [34] reported a significantly higher rate of moderate to severe dysphagia in patients who had undergone esophagectomy after an antireflux operation. Therefore, management of dysphagia in patients who have had previous antireflux operations and who undergo esophagectomy can also present a challenging problem.

In one of the largest redo antireflux experiences, we previously reported a significant improvement in dysphagia scores after redo antireflux operations in a
paired analysis [28]. The improvement in dysphagia after takedown of the Nissen fundoplication and conversion to RNYNEJ may in part result from the fact that an RNYNEJ is relatively less obstructing than a fundoplication. In another study comparing RNY bypass and redo fundoplication after failed antireflux operations, overall outcome of patients was equal in both groups despite the higher rate of operative risk factors in the RNY bypass group. These investigators concluded that patients with more complex underlying pathologic conditions benefited more from RNY diversion; however, dysphagia was the only symptom that did not improve significantly after RNY bypass, which they attributed in part to pouch size [27]. It is easier to understand how complete acid and bile diversion may significantly improve reflux after RNYNEJ; however, dysphagia is multifactorial and may not necessarily improve after RNYNEJ. In our current series with RNYNEJ, we noted a significant improvement in dysphagia. Similarly, we observed improvement of regurgitation, likely caused by improved esophageal emptying after complete esophageal mobilization and conversion of an obstructed fundoplication with hiatal hernia to a patent unobstructed anastomosis. In addition, extensive nutritional and dietary education focusing on eating small and frequent meals also helps improve regurgitation in some patients.

Although, RNYNEJ after failed antireflux operations is performed primarily for recurrent intractable GERD, other benefits include weight loss and improvement in comorbidities. The median BMI was reduced significantly in our series. A significant change in patient BMI or estimated weight loss ranging from 60% to 71% with improvement or resolution of more than 70% of comorbidities has been reported in patients in whom conversion to RNY bypass was undertaken after a failed fundoplication [13, 17, 31, 32, 35]. After detailed discussion regarding surgical options for a failed fundoplication, obese patients may opt for the added benefits of weight loss and improvement in their comorbidities. Trends in obesity operations indicate that the majority of patients undergoing weight loss operations are women [36, 37]. Two of the largest experiences report a morbidity rate ranging from 10% to 14.7% and a mortality rate ranging from 0% to 0.3% for redo fundoplication [28, 38]. In the current series, which is the largest experience of RNY bypass after fundoplication to date, we report 24% morbidity and no mortality. These findings are consistent with other published reports, although the patients were more complex.

A major strength of this study is that, to our knowledge, it is the largest study investigating outcomes after RNYNEJ for a failed antireflux study. This study has several limitations, including those which are common to all retrospective studies such as selection bias. We also need further follow-up to fully analyze the outcomes in this patient population. All patients in this series were overweight or obese (BMI > 25) and 78% of the patients were obese (BMI > 30), and this was a common underlying factor in all the patients who underwent Roux-en-Y for failed antireflux surgery. We need to further investigate and analyze patient variables that influence outcomes, because this may help us to better select patients for a particular type of operation (ie, redo fundoplication, RNYNEJ, or esophagectomy).

At present, an individualized approach is preferred at our institution. RNY bypass is a life-altering operation and should ideally be performed after a failed fundoplication and only at an experienced high-volume center. There needs to be extensive patient education to aid with proper selection. The variables that we consider in the selection of patients for RNY bypass versus a redo fundoplication include overweight and obese patients with increased BMI, multiple previous redo antireflux procedures, esophageal dysmotility, delayed gastric emptying, severe comorbidities, and the patient’s desires because it is a life-altering operation. These variables need to be studied prospectively to define optimal candidates, and further work is required for optimizing patient selection.

In conclusion, in this largest series to date investigating RNYNEJ for persistent GERD after antireflux operations, we demonstrated that in appropriately selected patients, RNYNEJ can be performed safely with good results at an experienced center by surgeons with extensive experience in esophageal operations. RNYNEJ should be considered an important option for the treatment of intractable recurrent symptoms after antireflux operations, particularly in obese patients.

References

DR THOMAS VARGHESE, JR (Seattle, WA): One question. Preoperatively, for your obese patient population, do they get the same preoperative preparation that the morbid obesity surgical patients typically have, such as nutritional assessment for weight loss, psychologic profiles, things like that?

DR AWAIS: Thank you for your question. The extent of preoperative preparation depends on the severity of patients’ symptoms. Our referrals are primarily for recurrent intractable reflux in the setting of failed antireflux surgery; therefore, the focus on obesity is not our primary concern, yet specific counseling and preparation for a lifestyle-altering surgery is given to each patient. While psychologic profiles are assessed selectively, all patients receive dietary counseling and preparation for a Roux-en-Y. All patients are asked to review a video and a book, so they can better understand their procedure. In addition, in order to give further insight, patients are encouraged to speak with others who had a fundoplication converted to a Roux-en-Y. Finally after all documents are reviewed and testing has been completed, at a second office visit, all issues and concerns are addressed with each patient.

DR HIRAN FERNANDO (Boston, MA): Omar, that was a good presentation. A couple of questions. In terms of methods of failure leading to the need for reoperation, do you have a sense of how many had slipped Nissen, how many patients were complaining of dysphagia, and how many had recurrent hernias?

And the second question is that you had a group of patients who had a BMI of greater than 25, but I guess less than 30. Why did you choose this group for Roux-en-Y rather than doing another reoperation? Were these third-time failures that you felt you didn’t have a better option?
DR AWAIS: Thank you Dr Fernando for your questions.

In this series we did not evaluate patterns of failure, rather focused on outcome analysis; however, the most common finding on preoperative testing and during the operation was a recurrent hiatal hernia. We did notice dysphagia as a preoperative symptom in about 50% of our patients.

Our approach to considering converting a failed fundoplication to Roux-en-Y is individualized. One of the variables we use to help us decide is BMI. Other factors we consider are esophageal dysmotility, delayed gastric emptying, multiple previous operations, and medical comorbidities. In our current series, all patients had a BMI more than 25 and 80% of the patients had a BMI more than 30. There is no specific formula to help decide the best surgical option for patients with BMI between 25 and 30 who need reoperative antireflux surgery. Majority of those patients undergo a redo fundoplication at our institutions and for us to consider Roux-en-Y, we critically evaluate other patient factors. In those 20% of patients with BMI between 25 and 30, all had multiple previous antireflux procedures and severe dysmotility, while majority had delayed gastric emptying.

DR STEVEN DEMEESTER (Los Angeles, CA): Very interesting work. I have a couple questions. In contrast to patients having this procedure for morbid obesity where the lower esophageal sphincter is usually relatively intact, all of these patients essentially by definition have a defective lower esophageal sphincter, and now you’ve taken away their fundoplication and opened the door for significant regurgitation, which can happen even in patients where you do a Roux-en-Y esophageojunostomy; they can come back with significant regurgitation from the Roux limb. So how often was regurgitation a complaint in these patients?

The second issue is on multiple reoperations; oftentimes the GE junction area is relatively ischemic. How often do you think your leaks were related to poor blood supply in that gastric remnant that perhaps should have been excised completely?

DR AWAIS: Thank you, Dr DeMeester for your insightful comments and questions. To answer your first question regarding the regurgitation, we noted a significant improvement in postoperative regurgitation in these patients during the last follow-up. Preoperatively, nearly 70% of patients experience regurgitation and only about 10% postoperatively. Why is that? I’m not quite sure. If we consider esophageal dysmotility a common factor in our patients, perhaps the fundoplication is more obstructing in some ways as opposed to a wide open anastomosis between the esophagus and small bowel, but in our evaluation of patients, one of the symptoms that improved significantly was regurgitation.

To answer your second question, we note that after multiple redos the stomach actually may be conditioned; however, we perform a detailed assessment with an on-table endoscopy for leaks before and after constructing the Roux-en-Y anastomosis. Prior to constructing our anastomosis, an endoscopy allows for proper assessment of the esophagus and gastric cuff. With this valuable information, we can decide if a true esophagojejunitostomy or an esophagectomy is necessary. Certainly by following these steps in every case, we can easily recognize obvious ischemia. In the 10% of patients who had a leak postoperatively, it is difficult to say conclusively that ischemia was the only factor.

DR THOMAS WATSON (Rochester, NY): Omar, that was a very nice series, very nicely presented. I have a few questions for you.

Number one, over half of your patients had undergone only a single failed fundoplication. I assume that most of those patients had some other risk factor that led to the recommendation for a Roux-en-Y procedure as opposed to a second fundoplication. Can you elucidate what the factors are that would make you want to abandon a redo fundoplication?

And to turn that around a little bit, in the absence of those risk factors, how many failed fundoplications do you think one needs to have undergone before you should avoid doing another fundoplication and move on to a Roux-en-Y? To help answer that, do you know the results of your patients undergoing redo fundoplication to serve as a comparison group?

DR AWAIS: Thank you Dr Watson for thoughts and questions. You are correct that over half of our patients had a single previous antireflux procedure. The first-time redos with a BMI greater than 35 you have a valid reason to do a Roux-en-Y in those patients. BMI would be one factor to consider.

The gray zone comes with a BMI between 30 and 35. In that situation I don’t think you can consider BMI as the only patient variable. You should look at other factors, such as esophageal dysmotility, delayed gastric emptying such as that seen with previous vagal nerve injuries, and severe comorbidities (diabetes, sleep apnea, etc). So these are the factors that would cause me to likely not consider a redo fundoplication.

Your other question of how many previous redo would prohibit us from performing another fundoplication is a bit difficult to answer. Some have suggested that after 3 previous antireflux operations, a redo fundoplication is not advised; we feel it is more individualized. We have seen patients who have had 3 or 4 previous operations, yet in operating room it seems as if they only had 1 or 2. In reality, patients with multiple redos usually tend to have other factors that make it easier for us to decide. If I had to pick a number, I would say after 3 operations, you probably come to point of diminishing return.

During this same time period, we performed over 400 redo fundoplications; therefore, the subset of patients where a Roux-en-Y was performed was about 20%. So clearly this is not an operation that we advocate for all comers who had a previous failed Nissen. We are in the process of comparing and analyzing the outcomes of redo fundoplications with the Roux-en-Y subset.

I do feel there are variables out there that we should look at for the future, and we’re in the process of looking at over 500 patients now as predictors and selection of what operation is needed after a failed fundoplication. For example, if you look at factors such as BMI, obstructive symptoms of regurgitation and dysphagia, multiple reoperations, esophageal dysmotility, delayed gastric emptying, are those factors predictors of the success of an operation? I think there is some data to suggest that if you have 4 of these factors that have been described, that Roux-en-Y may be a better option. At present, we still think an individual approach is the best, but we should look at that when we next evaluate our experience.

DR WATSON: Another question then. Are there times when you will remove the distal gastric remnant? I concluded from your presentation that you always leave the distal remnant intact just as you would for obesity surgery. I suggest that for patients with gastroparesis or severe epigastric pain, there are times when you should take out the distal stomach.

DR AWAIS: We haven’t seen that in our experience. Certainly the downside of taking the remaining gastric remnant out is that it’s a bigger operation. Secondly, we have seen patients who had esophageal cancer in the distal esophagus after Roux-en-Y, so in those patients we have conditioned the stomach and used that as a conduit after an esophagectomy. So we tend to leave the stomach in situ unless there is an obvious reason that it was
devascularized. In regards to drainage of the gastric remnant, once it’s partitioned, it will not see a solid meal again, so in our experience we have not noticed patients complaining of gastroparesis pain.

DR SEBASTIEN GILBERT (Ottawa, Ontario, Canada): Excellent presentation, Dr Awais. Could you please discuss the range of Roux limb length used in light of the wider BMI range in this patient population?

DR AWAIS: Thanks, Sebastien. Our Roux limb is usually around 80 cm long. You have to factor in the fact that the longer Roux limbs may lead to malabsorption, such as iron deficiency anemia, calcium deficiencies, and our primary indication is recurrent intractable reflux. We follow these patients very closely after the operation for malabsorption, so our cutoff for Roux limb is usually between 80 or 100 cm at the most based on the BMI. If the BMI is more than 35, we’ll consider 100, but anything below 35, we don’t go beyond 80 cm for the Roux limb.