Value of Routine Postoperative Gastrographin Contrast Swallow Studies After Laparoscopic Gastric Banding

Eldo E. Frezza, MD, MBA; Joseph G. Mammarappallil, PhD; Chance Witt, BS; Cai Wei, MD; Mitchell S. Wachtel, MD

Hypothesis: Laparoscopic adjustable gastric banding (LAGB) effectively treats morbid obesity and yields improved quality of life with low morbidity and mortality rates. The current standard of care is to perform a postoperative gastrographin study. This study evaluated a series of patients to determine the usefulness of this routine procedure.

Design: Retrospective analysis.

Setting: Texas Tech University Health Sciences Center, Lubbock.

Patients: A series of 100 patients who had undergone LAGB between August 1, 2006, and February 28, 2007, were evaluated by medical record review and a blinded examination of the upper gastrointestinal tract.

Main Outcome Measures: Laboratory test results and patient vital signs.

Results: The mean age of the patients was 42 years. The mean initial body mass index (calculated as weight in kilograms divided by height in meters squared) was 50.0. Median excess weight loss was 49.0% after 12 months. Three patients did not undergo gastrographin studies because of a history of allergic reactions to the dye. No differences between the opinion of the surgeon and that of the original radiologist were uncovered. The 97 patients who underwent gastrographin studies lacked leaks; the only radiologic abnormalities were slow passage and reflux in 23 patients. No alteration in patient care resulted. The total cost for the 97 patients was $49,470. The 95% confidence interval for 0 useful results for 97 studies is 0.00 to 0.03; at best, 3.2% of patients undergoing this expensive study would have garnered some benefit.

Conclusion: Routine postoperative upper gastrointestinal tract studies are expensive and of limited value. Instead of relying on them to detect leaks, which are extremely rare after LAGB, reliance should be given to the presence or absence of tachypnea and tachycardia, as is currently done for Roux-en-Y gastric bypass. In this way there will be a cost savings and the potential to make LAGB a same-day procedure.

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METHODS

The medical records of 100 consecutive patients who had undergone LAGB between August 1, 2006, and February 28, 2007, at Texas Tech University Health Sciences Center, Lubbock, were retrospectively evaluated after institutional review board approval. Patients with a body mass index (calculated as weight in kilograms divided by height in meters squared) greater than 40, with or without comorbidities, and those with a body mass index of 35 to 40 were candidates for LAGB (Table 1). All patients underwent routine preoperative medical and surgical evaluations, preoperative upper gastrointestinal
(GI) tract endoscopic examinations, preoperative esophageal manometric studies, and mechanical evaluation. Follow-up of the patients was performed for 24 hours to evaluate signs of tachycardia and tachypnea. Postoperatively, we evaluated a series of blood tests and vital signs to match with potential upper GI tract abnormalities (Table 2). A liquid diet was instituted on postoperative day 1. The morning after surgery, each patient who did not have a contraindication for a radiologic examination experienced an upper GI tract radiologic examination with gastrographin (Omnipaque; GE Healthcare Services, Chalfont St Giles, England) at a concentration of 300 mg/mL; 30 to 50 mL was swallowed by the patient while standing, after which radiographic images were taken every 2 to 4 seconds. Follow-up images were obtained in both the anteroposterior and left oblique projections at the level of the port and band site. On the morning of the upper GI examination, the surgeon independently read the upper GI tract report at the end of the study and compared it with the radiologic report written by the attending radiologist. Therefore, the surgeon knew about the clinical situation but did not know about the report of the radiologist and the findings of the upper GI tract report because the report had been written by the radiologist after the surgeon had read the study. In this type of reading, the radiologist overestimated some of the reflux and stasis conditions. This was only an 83.0% concordance between the 2 readings.

The data were collected independently by 2 medical students (C.W. and J.G.M.), and the radiographs were interpreted independently by the surgical and radiologic attending physicians. Costs were obtained from the medical records of the patient. The 95% confidence interval for the proportion of patients who might have had an alteration in patient care from the study was calculated by the use of an online calculator.15

### RESULTS

Of 100 patients who underwent LAGB, 88 were women. The mean age of the patients was 42 years. The mean initial body mass index was 50.1. The demographics are reported in Table 1. We evaluated laboratory test results and vital signs for each patient, and the results are reported in Table 2. Median excess weight loss was 49.0% after 12 months. Three patients did not undergo gastrographin studies because of a history of allergic reactions to the dye. No differences between the opinion of the surgeon and that of the original radiologist were uncovered. The 97 patients who underwent gastrographin studies lacked leaks; the only radiologic abnormalities were slow passage and reflux in 23 patients. No alteration in patient care resulted. Each study yielded a technical fee charge of $400 and a radiologist bill of $110 for a total of $510 per patient and $49 470 for all 97 patients. The 95% confidence interval for 0 useful results for 97 studies is 0.00 to 0.03; at best, 3% of patients undergoing this expensive study would have garnered some benefit.

### Table 1. Characteristics of the 100 Study Patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial BMI, mean (SD)</td>
<td>50.1 (7.0)</td>
</tr>
<tr>
<td>Initial weight, mean (SD), kg</td>
<td>139.86 (31.99)</td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>42 (11)</td>
</tr>
<tr>
<td>Sex, No.</td>
<td>Male 22.0 Female 88.0</td>
</tr>
<tr>
<td>Status, No.</td>
<td>Normal 74.0 Abnormal 23.0</td>
</tr>
<tr>
<td>Reflux, No. (%)</td>
<td>11/23 (47.8)</td>
</tr>
<tr>
<td>Slow passage, No. (%)</td>
<td>12/23 (52.2)</td>
</tr>
<tr>
<td>Not performed, No. (%)</td>
<td>3/23 (13.0)</td>
</tr>
</tbody>
</table>

Abbreviation: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared).

### Table 2. Comparison of Patients With Normal Upper GI Tract Examination Results vs Those With Reflux or Stasis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Normal Results</th>
<th>Reflux or Stasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>41 (11)</td>
<td>45 (10)</td>
</tr>
<tr>
<td>Initial BMI</td>
<td>49.6 (7.5)</td>
<td>51.5 (4.7)</td>
</tr>
<tr>
<td>Initial weight, kg</td>
<td>137.8 (33.4)</td>
<td>146.5 (27.1)</td>
</tr>
<tr>
<td>Temperature, °C</td>
<td>37.06 (−17.30)</td>
<td>37.11 (−17.30)</td>
</tr>
<tr>
<td>Systolic blood pressure, mm Hg</td>
<td>127.5 (17.1)</td>
<td>126.2 (15.4)</td>
</tr>
<tr>
<td>Diastolic blood pressure, mm Hg</td>
<td>85.5 (10.9)</td>
<td>67.4 (11.2)</td>
</tr>
<tr>
<td>Heart rate, per min</td>
<td>73.4 (12.2)</td>
<td>76.6 (15.1)</td>
</tr>
<tr>
<td>Respiratory rate, per min</td>
<td>16.9 (2.5)</td>
<td>16.8 (1.1)</td>
</tr>
<tr>
<td>Saturation, %</td>
<td>95.9 (2.9)</td>
<td>97.1 (2.2)</td>
</tr>
<tr>
<td>Sodium, mEq/L</td>
<td>137.3 (2.0)</td>
<td>135.3 (2.1)</td>
</tr>
<tr>
<td>Chloride, mEq/L</td>
<td>104.2 (4.0)</td>
<td>103.5 (1.5)</td>
</tr>
<tr>
<td>Serum urea nitrogen, mg/dL</td>
<td>8.6 (3.4)</td>
<td>10.3 (3.8)</td>
</tr>
<tr>
<td>Potassium, mEq/L</td>
<td>4.1 (0.6)</td>
<td>4.2 (0.4)</td>
</tr>
<tr>
<td>Calcium, mEq/L</td>
<td>2.67 (4.9)</td>
<td>23.8 (3.9)</td>
</tr>
<tr>
<td>Creatinine, mg/dL</td>
<td>0.7 (0.2)</td>
<td>0.8 (0.2)</td>
</tr>
<tr>
<td>Glucose, mg/dL</td>
<td>108.9 (21.4)</td>
<td>90.0 (30.1)</td>
</tr>
<tr>
<td>White blood cell count, per μL</td>
<td>8500 (5500)</td>
<td>10 900 (1900)</td>
</tr>
<tr>
<td>HgbA, g/dL</td>
<td>12.3 (1.2)</td>
<td>11.5 (1.2)</td>
</tr>
<tr>
<td>Platelets, ×10⁹/L</td>
<td>212.7 (56.7)</td>
<td>242.2 (48.1)</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>36.0 (3.6)</td>
<td>33.2 (3.8)</td>
</tr>
</tbody>
</table>

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); GI, gastrointestinal; HgbA, hemoglobin-binding protein A. SI conversion factors: To convert sodium, chloride, potassium, and bicarbonate to millimoles per liter, multiply by 0.1; to convert serum urea nitrogen to millimoles per liter, multiply by 0.357; to convert creatinine to micromoles per liter, multiply by 88.4; to convert glucose to millimoles per liter, multiply by 0.0555; to convert white blood cell count to ×10⁹/L, multiply by 0.001; to convert hemoglobin to grams per liter, multiply by 10.0; to convert platelets to ×10⁹/L, multiply by 1.0.

*Data are presented as mean (SD).

This study found that 97 consecutive upper GI tract examinations at a total cost of $49 470 yielded no results that altered patient care. Devised in 1983 and put into practice in 1993, LAGB was the first bariatric procedure that added an element of adjustability to the armamentarium of the bariatric surgeon.15-19 The procedure produces low morbidity and mortality rates,8,9,20,21 with only approximately one-third of patients experiencing problems.22 Approximately 1 in 10 patients require additional surgery in the immediate postoperative period.8-11,22-25 Early complications include band malpositioning, perforation, stomal obstruction, regurgitation, and pouch esophageal reflux; late complications include band herniation, band migration, slippage, port dilatation, port infection, and erosion.8,12,13 In 1% of the patients there is improper positioning of the band at...
surgery and early slippage. Stomal obstruction may occur in 1.4% of patients, but most of the time this does not require surgery and the medical therapy is sufficient. Dysphagia can occur in 14% of patients, and regurgitation and pouch esophageal reflux are common and usually resolve with dietary change. In the long term, complications include pouch dilatation and slippage of the gastric band. These complications require a diagnostic tool, such as fluoroscopy. Other complications, such as intragastric erosion with secondary obstruction, potential leak, and system infection, require surgery. Gastric necrosis occurs in 0.3% of the patients. Gastroesophageal perforation occurs in less than 0.5% of patients; leaks are usually related to the operative technique and are the most severe immediate postoperative complication. The severity of this complication has rendered postoperative upper GI tract radiologic examinations with gastrographin the standard of care. The rarity of this complication renders somewhat dubious the benefits of performance of a study that costs more than $500 per patient and sometimes fails to detect leaks. Moreover, the radiologic study places the patient at risk for aspiration pneumonia, although the exact incidence of these complications has not been determined. Apart from detection of leaks, there is little reason to order such a radiologic study. Radiologic demonstration of free passage of food through the stomach is not mandatory in the postoperative follow-up. Apart from leaks, all other abnormalities that might be detected by this study are managed without surgery and then only if symptoms that would lead to their detection are bothersome; their radiologic postoperative identification does not serve to advance patient care. Only a potential leak has to be repaired surgically; all others can be treated medically.

In our study, we also evaluated whether there was any correlation between upper GI tract abnormalities and blood test results, such as complete blood cell counts and electrolyte levels, and vital signs, such as blood pressure, heart rate, and oxygenation. As reported in Table 2, no notable differences were found in patients with reflux or stasis. We cannot comment on leaks because we did not have any. Seven patients were seen in the office or in the emergency department for nausea and dehydration, but no correlation was found with previous upper GI tract procedures. For other bariatric procedures, such as Roux-en-Y gastric bypass (RYGBP) and duodenal switch, the best monitor is nonradiologic: tachycardia and tachypnea are sufficiently sensitive to allow surgeons to rely on them to detect leaks, which are extremely rare after LAGB, reliance should be given to the presence or absence of tachypnea and tachycardia, as is currently done for RYGBP.

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Author Contributions: Study concept and design: Frezza and Mammarappallil. Acquisition of data: Mammarappallil, Witt, and Wei. Analysis and interpretation of data: Frezza, Mammarappallil, Witt, and Wachtel. Drafting of the manuscript: Frezza, Wei, and Wachtel. Critical revision of the manuscript for important intellectual content: Frezza, Mammarappallil, and Wachtel. Statistical analysis: Wachtel. Administrative, technical, and material support: Frezza, Mammarappallil, and Witt. Study supervision: Frezza.

Financial Disclosure: None reported.

REFERENCES


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**Correction**

**Author Added to Byline.** In the article titled “Changes in the Use of Carotid Revascularization Among the Medicare Population,” by Goodney et al, published in the February 2008 issue of the *Archives* (2008;143[2]:170-173), an author was omitted from the byline. The bylines on pages 107 (right-hand column, “Original Articles” section) and 170 should have read as follows: Philip P. Goodney, MD, MS; F. Lee Lucas, PhD; Lori L. Travis, MD; Donald S. Likosky, PhD; David J. Malenka, MD, MS; Elliott S. Fisher, MD, MPH. Also on page 170, in the “Author Affiliations” section, Ms Travis should have been listed along with Dr Lucas and the entry should have read as follows: “... Center for Outcomes Research and Evaluation, Maine Medical Center, Portland (Dr Lucas and Ms Travis);...” On page 173, left-hand column, Ms Travis should have been added to 5 entries in the “Author Contributions” section. The section should have read as follows: “**Author Contributions:** Study concept and design: Goodney, Likosky, Malenka, and Fisher. Acquisition of data: Goodney, Travis, and Fisher. Analysis and interpretation of data: Goodney, Lucas, Travis, Likosky, and Malenka. Drafting of the manuscript: Goodney, Likosky, and Malenka. Critical revision of the manuscript for important intellectual content: Goodney, Lucas, Travis, Likosky, Malenka, and Fisher. Statistical analysis: Goodney, Lucas, Travis, Likosky, and Malenka. Obtained funding: Goodney. Administrative, technical, and material support: Goodney, Travis, Malenka, and Fisher. Study supervision: Goodney and Malenka.”

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