PAPER

A New and Simplified Technique for Laparoscopic Gastric Bypass in a Residency Training Program

Decreased Resource Utilization and Enhanced Training

Matthew J. Martin, MD; Matthew J. Eckert, MD; William E. Eggebroten, MD; Alec C. Beekley, MD

Background: Laparoscopic gastric bypass (LGB) is an advanced complex procedure. Teaching programs must balance resident training and participation with resource utilization, patient safety, and outcomes. We prospectively studied a new simplified LGB technique (S-LGB) in a residency training program.

Design: Prospective observational study.

Setting: Academic bariatric program.

Patients: All patients undergoing S-LGB during 17 months.

Interventions: Clinical data collection and surgeon survey.

Main Outcome Measures: Resource utilization, patient outcomes, and resident/staff satisfaction.

Results: There were 140 S-LGB operations performed by 4 staff members, all with postgraduate year 2 through 5 residents. There were no major intraoperative complications and no anastomotic leaks or deaths. Mean operative time for cases with no concurrent procedures was 91 minutes, with no intraoperative transfusions and 1 conversion to an open procedure. Compared with our standard technique, operative times with simple S-LGB decreased by an average of 56% for all staff (range, 45%-60%; $P<.01$). Lower postgraduate year level increased operative times with the standard technique but not with S-LGB. The anastomotic stricture rate decreased from 10.0% to 3.6% ($P=.02$). The mean excess body weight lost at 3, 6, and 12 months was 42%, 55%, and 87%, respectively. All staff surgeons preferred the S-LGB technique for technical difficulty, speed, safety, and ability to teach residents. Residents scored the S-LGB significantly better than our standard technique for difficulty, learning curve, and overall satisfaction (all $P<.05$).

Conclusion: Introduction of S-LGB has resulted in excellent outcomes and significant reductions in resource utilization while enhancing opportunities for resident teaching and full participation.

Arch Surg. 2010;145(9):844-851

LAPAROSCOPY HAS NOW BEcome the preferred modality for performing a variety of bariatric surgical procedures. Although all of these require advanced laparoscopic skills, the laparoscopic gastric bypass (LGB) is the most difficult to learn and master. Previous studies have identified a steep learning curve characterized by longer operative times and increased complication rates during the early experience.[1-7] Methods that have been proposed to eliminate or decrease this have included mentorship programs, formal courses, simulator training, and the establishment of minimally invasive/bariatric fellowship programs.[8-11] However, even after mastery of this procedure there remains a considerable risk of major morbidity or mortality.[12]

See Invited Critique at end of article

Bariatric surgery represents an increasingly important component of training programs for surgical residents and postgraduate fellows. With the already demonstrated steep learning curve for even staff physicians, academic centers often struggle between optimizing patient safety and outcomes and the mandate to train surgical residents in advanced laparoscopic techniques. In many centers this has limited the ability of surgical trainees to perform or even to serve as first assistant in these procedures.[13]

The reported surgical techniques for LGB vary widely and are typically based on surgeon training, personal preference, and available equipment. In centers (such as ours) where residents are expected to actively assist with or perform LGB, the choice of technique must safely accommodate the varying levels of knowl-

Author Affiliations:
Department of Surgery, Madigan Army Medical Center, Tacoma, Washington.

Figure 1. Trocar size and positioning for the simplified gastric bypass technique.

edge and skill of the participating resident. This frequently results in some adverse effects, such as prolonged operative times, blood loss, or technical mistakes. The purpose of this study was to prospectively collect and report our experience with a new and simplified technique for LGB introduced in our active academic bariatric practice. Our objectives were to analyze the short- and longer-term outcomes with this new procedure in terms of patient safety and outcomes, resource utilization, and weight loss. In addition, we sought to quantify the perceptions and opinions of the staff and resident surgeons performing this new technique.

METHODS

This study was conducted at Madigan Army Medical Center, a military tertiary referral center and Accreditation Council for Graduate Medical Education–approved general surgery resident training program. A key component of the resident training program is a high-volume bariatric surgery service staffed by 7 attending surgeons. The service operates under the mandate from the program director that surgical residents should actively participate in all cases and operate in the primary surgeon position whenever possible.

STANDARD LGB TECHNIQUE

The 6 attending surgeons who perform LGB adopted a standard surgical technique in 2003. This technique used a 25-mm circular stapler to perform the antecolic, antegastric gastrojejunostomy. The stapler anvil was introduced through the abdominal wall and placed into the pouch via a greater curve gastrotomy. The pouch was then created, followed by the gastrojejunostomy. A 40-cm biliopancreatic limb was measured and transected by linear stapler, and a 100- to 150-cm Roux limb was created. A side-to-side stapled jejunojejunostomy was then performed and the mesenteric defect was closed with interrupted or running suture.

SIMPLIFIED LGB TECHNIQUE

In May 2008 one of us (M.J.M.) developed and introduced a new simplified technique for performing LGB (S-LGB). This was done by eliminating the circular stapler and converting to a totally stapled linear gastrojejunostomy, creating the anastomosis before pouch formation, and simplifying the jejunojejunostomy and mesenteric defect closure. The S-LGB technique was subsequently adopted by the other 3 staff surgeons performing LGB during the study period. All cases were performed with the resident in the operating surgeon position (patient right) and the staff surgeon in the first assistant position (patient left).

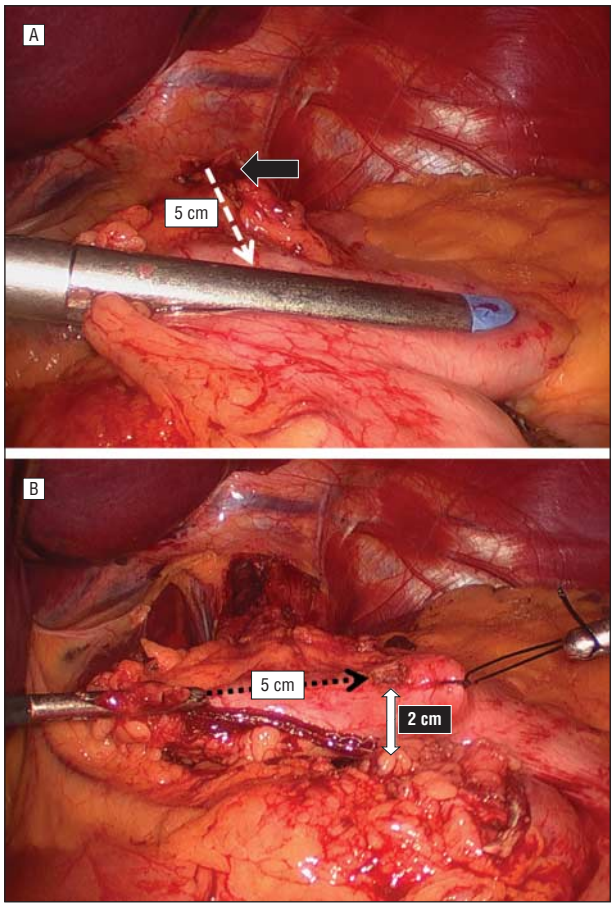

Figure 2. Initial preparation of the gastric pouch. A, First a 60-mm transverse staple line is started 5 cm distal (white arrow) to the gastroesophageal junction (black arrow). B, Pouch area prepared for anastomosis by making gastrotomy approximately 5 cm from the lesser curve (dashed black arrow) and
1 to 2 cm away from the transverse staple line (white arrow). A silk suture is placed for traction during anastomosis.

For the S-LGB, 6 trocars are inserted in a diamond pattern as shown in **Figure 1**. The inferior border of the pouch is formed by a single firing of a 60-mm linear stapler (**Figure 2**A). A gastrotomy is then made at the inferior left corner of the pouch (Figure 2B). A traction suture is placed lateral and inferior to the gastrotomy. The greater omentum is then divided at the midpoint, the ligament of Treitz is identified, and the jejunum is run approximately.

The jejunum is divided with a linear stapler with no division of the mesentery (**Figure 3**A). An enterotomy is then made on the stapled end of the Roux limb. A 45-mm linear stapler is introduced via the left-upper-quadrant trocar and the lower jaw is passed into the Roux limb enterotomy (Figure 3B). The upper jaw is then passed into the gastric pouch via the previously made gastrotomy (Figure 3C). The pouch is pulled onto the stapler by means of the traction suture; the stapler is rotated clockwise, closed, and fired, creating a linear gastrojejunostomy. The edges of the common enterotomy (including the traction suture) are grasped and elevated and then closed with

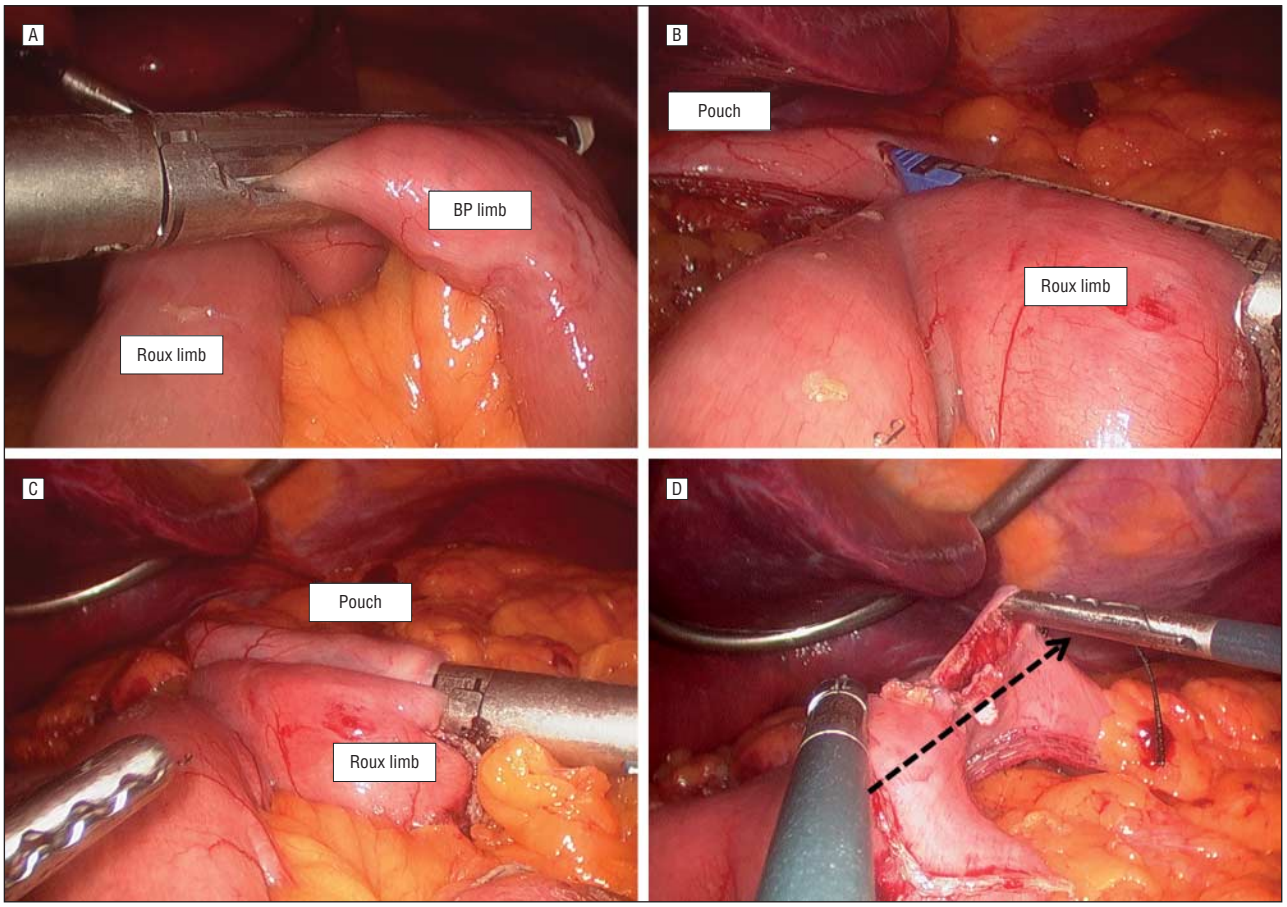

Figure 3. Creation of the gastrojejunostomy. A, Division of the proximal jejunum 30 to 40 cm distal to the ligament of Treitz. Note that no mesentery is divided. BP indicates biliopancreatic. B, Introduction of a 45-mm linear stapler through the enterotomy made in the end of the Roux limb and the previously created gastrotomy. C, Creation of a linear stapled gastrojejunostomy in the antegastric position. D, Elevation and closure of the common enterotomy with linear stapling (dashed black arrow).

the linear stapler (Figure 3D), resulting in a 1.5- to 2-cm-diameter anastomosis. A 34F bougie is passed transorally through the anastomosis. The pouch is now completed by serial vertical firings of the linear stapler. Before the first vertical staple load is fired, the staple line from the common enterotomy closure is grasped and retracted laterally, thus including it in the excluded remnant and not the gastric pouch (**Figure 4**).

Two silk sutures or self-securing distal anastomosis devices (U-Clips; Medtronic Inc, Minneapolis, Minnesota) are placed to reinforce the anterior wall of the gastrojejunostomy. The Roux limb is run for 100 to 150 cm and a triple-stapled technique, as described by Madan and Frantzides,[14] is used to create the jejunojejunostomy. A 90-mm-long side-to-side anastomosis is created with 2 firings of the 45-mm linear stapler (1 proximally, 1 distally). The edges of the common enterotomy are then grasped, elevated, and closed with a linear stapler (**Figure 5**A). The mesenteric defect is closed with a running silk suture that is secured at either end with clips rather than a knot (Figure 5B). A leak test is then performed and a 10-mm Jackson-Pratt drain is placed overlying the gastrojejunostomy.

STUDY METHODS AND DEFINITIONS

A prospective observational study was performed from May 1, 2008, through December 31, 2009. All patients undergoing a primary LGB using this simplified technique were included. Patients undergoing an open procedure or conversion of a prior bariatric procedure were excluded. Data were collected and maintained by the principal investigator (M.J.M.) on a computer spreadsheet. All noted complications were discussed and clarified with the responsible surgeons. Follow-up was performed per our protocol, with postoperative visits at 1, 3, 6, 9, and 12 months. All hospital readmissions for any reason during the study period were noted and included for analysis.

Each S-LGB procedure was further classified as simple or complex to clarify the data regarding operative times. *Simple procedures* were those that involved only the gastric bypass. A *complex procedure* was any defined surgical procedure that was performed in addition to the LGB, such as cholecystectomy. The recorded operative times for the complex cases were the total time required for all procedures. For comparison, our operating room database was queried for all standard LGB procedures performed by the same 4 staff surgeons from 2006 through 2008. Only simple cases with no additional concurrent procedures were included in the conventional LGB group. Data collected included the operative time, blood loss, and postgraduate year (PGY) of the resident.

To quantify the opinions of the staff and resident surgeons, an anonymous questionnaire was distributed to all involved staff surgeons and to all residents who had performed both the standard and the S-LGB technique. Respondents ranked the 2 procedures side by side on a numeric scale of 1 (lowest) to 10 (highest) for technical difficulty, learning curve, ability of resident to perform the case, ability to teach the procedure, risk of complications, reproducibility, and overall satisfaction.

Descriptive statistics including mean (SD), median (range), or percentiles were used for summary data. Univariate analyses were performed with the 2-tailed unpaired *t* test and Fisher

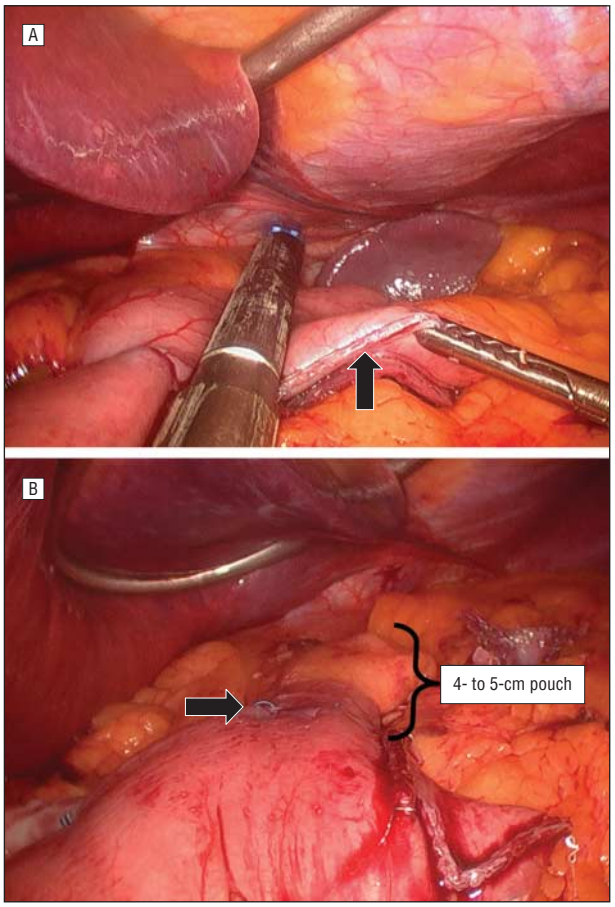

Figure 4. Completion of the pouch and anastomosis. A, Gastric pouch is now completed with vertical firing of the linear stapler over a 34F bougie. Note that the staple line from the common enterotomy closure (arrow) is excluded with the gastric remnant. B, Completed small pouch and gastrojejunostomy (arrow).

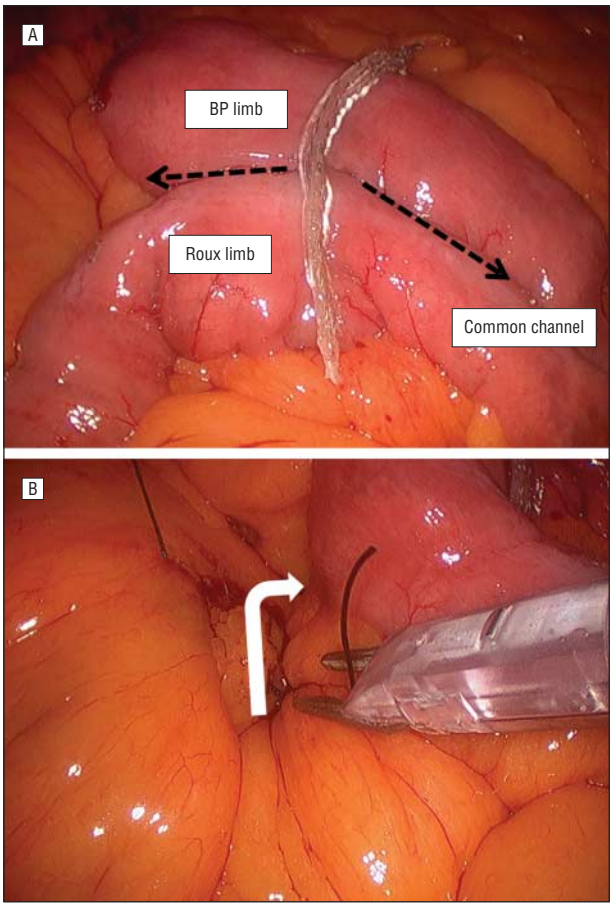

Figure 5. Jejunojejunostomy and mesenteric closure. A, Triple-stapled technique used with linear firings of 45 mm each (dashed black arrows) and transverse closure of the central common enterotomy. B, Mesenteric defect (white arrow) closed with a running silk suture and secured at each end with clips rather than knots.

exact test. Survey results were compared by the Mann-Whitney test. Significance was set at $P<.05$. All analyses were performed by means of SPSS version 14.0 (SPSS Inc, Chicago, Illinois). The local institutional review board approved both the prospective (S-LGB) and retrospective (standard technique) components of this study

RESULTS

A total of 140 S-LGB procedures were performed, all with PGY-2 through PGY-5 residents. The median follow-up was 8 months (range, 1-20 months), with all patients having at least 30-day data available. The demographics of the patient population are given in **Table 1**. More than half of the patients had a history of previous abdominal surgery. There was no attempt at selection of patients with favorable factors (ie, low body mass index, no previous surgery), and this was a consecutive sample with the only exclusion criteria as described in the "Study Methods and Definitions" subsection.

There were no major intraoperative complications or deaths. There were 11 (7.9%) minor intraoperative complications, including 2 bowel serosal tears, 7 enterotomies, and 2 complications of the gastrojejunostomy requiring immediate revision. Only 1 case (0.7%) required conversion to laparotomy for revision of an ischemic area of the gastric pouch. The mean (SD) estimated blood loss was 40 (40) mL, with no patient requiring an intraoperative blood transfusion. Concurrent procedures were performed in 53 patients (37.9%), most commonly cholecystectomy and hernia repairs.

The mean (SD) operative time for the S-LGB was 116 (50) minutes. Operative time for those undergoing simple S-LGB was 91 (27) minutes and for complex cases was 156 (54) minutes. Among the simple S-LGB cases (n=87), 51 (58.6%) were completed in less than 90 minutes and 74 (85.1%) in less than 2 hours. For comparison, a sample of the last 180 cases treated with the standard LGB technique by the same 4 surgeons was identified. Operative times for both simple and complex S-LGB were significantly shorter than with the previously used standard technique (mean, 209 [76] minutes; $P<.001$ for both). **Figure 6**A demonstrates the reduction in operative times with the S-LGB technique for all cases and for the subset of simple cases. Figure 6B demonstrates the same significant improvements in operative time for resident surgeons by PGY.

No anastomotic leaks were identified among the study population. Seven patients (5.0%) experienced complications during their hospital stay, including pneumonia (1 patient), pancreatitis (1), respiratory depression (1), uri-

Table 1. Demographics of Study and Control Populations

Variable	Simplified LGB (n=140)	Standard LGB[a] (n=180)
Age, mean (SD), y	44 (13)	42 (15)
Sex, No. (%)		
Male	13 (9.3)	18 (10.0)
Female	127 (90.7)	162 (90.0)
Preoperative BMI, mean (SD)	43 (5)	45 (7)
Superobese (BMI >50), No. (%)	16 (11.4)	25 (13.9)
Previous abdominal surgery, No. (%)[b]	94 (67.1)	107 (59.4)
Open	61 (43.6)	73 (40.6)
Laparoscopic	48 (34.3)	59 (32.8)

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); LGB, laparoscopic gastric bypass.
[a] *P* not significant for all comparisons.
[b] Some patients had more than 1 previous operation.

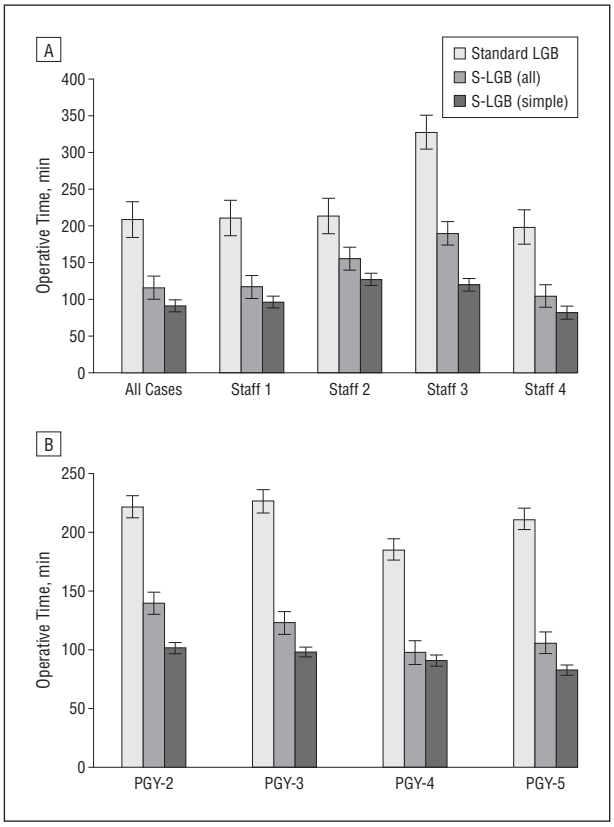

Figure 6. Mean (SD) operative times for staff surgeons (A) and residents (B) performing laparoscopic gastric bypass (LGB). Marked declines in operative times were demonstrated for all staff and all postgraduate year (PGY) levels with the simplified LGB (S-LGB) technique compared with the standard technique.

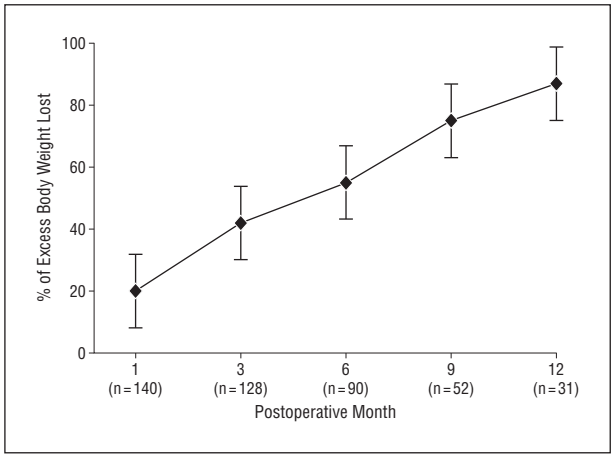

Figure 7. Percentage (SD) of excess body weight lost during the first postoperative year for simplified laparoscopic gastric bypass.

nary retention (1), and self-limited bleeding requiring transfusion (2). One patient required a return to the operating room on postoperative day 1 and was found to have a small enterotomy (grasper injury) that was repaired laparoscopically. This compares favorably with the 15% incidence of postoperative complications with the standard technique, including 5 patients requiring early reoperation for leak or obstruction. The mean postoperative length of stay was 2.4 days (range, 1-9 days), with no patients requiring an intensive care unit stay or prolonged hospitalization. The only major postdischarge complication occurred in 1 patient who returned 2 weeks after surgery with a small-bowel obstruction and femoral deep venous thrombosis. She underwent laparotomy with lysis of adhesions and recovered well. The incidence of symptomatic stricture was 3.6% (5 cases) with the S-LGB vs 10.0% (18 cases) with the standard technique ($P=.02$), and marginal ulcers were diagnosed in 2 (1.4%) of the S-LGB group vs 9 (5.0%) of the standard group ($P=.12$). All strictures among the S-LGB group patients were fully resolved after 1 to 2 endoscopic balloon dilations.

The observed postoperative weight loss was excellent, with a decrease in mean (SD) body mass index (calculated as weight in kilograms divided by height in meters squared) from 42.8 (5.3) preoperatively to 26.6 (3.3) at 1-year follow-up. **Figure 7** shows the weight loss during the first year with the number of patients at each follow-up point. On average, patients had lost 42% of their excess body weight at 3 months (n=128), 55% at 6 months (n=90), and 87% at 1 year (n=31). The maximum patient body mass index at 1 year was 32.

The results of the staff (4 surgeons) and resident (12 residents; 6 PGY-5, 3 PGY-4, 1 PGY-3, and 2 PGY-2) surveys demonstrated nearly unanimous preference for the S-LGB technique over the standard technique (**Figure 8**). The primary reasons staff surgeons cited for preferring the S-LGB technique were technical difficulty (75%) and operative time (25%). Among the 10 residents who stated that they plan to perform LGB when they begin independent practice, all chose the S-LGB over the standard technique. The primary reasons cited were technical difficulty (64%), operative times (18%), and patient safety (18%).

COMMENT

Laparoscopic gastric bypass has become the most commonly performed bariatric surgical procedure in the United States. It is widely accepted as the current criterion standard on the basis of its proven safety, efficacy, and durability.[15] However, it is also among the most technically challenging and demanding advanced laparoscopic procedures in the abdomen. Several series have identified a learning curve of between 50 and 150 cases for a staff surgeon to attain proficiency in this proce-

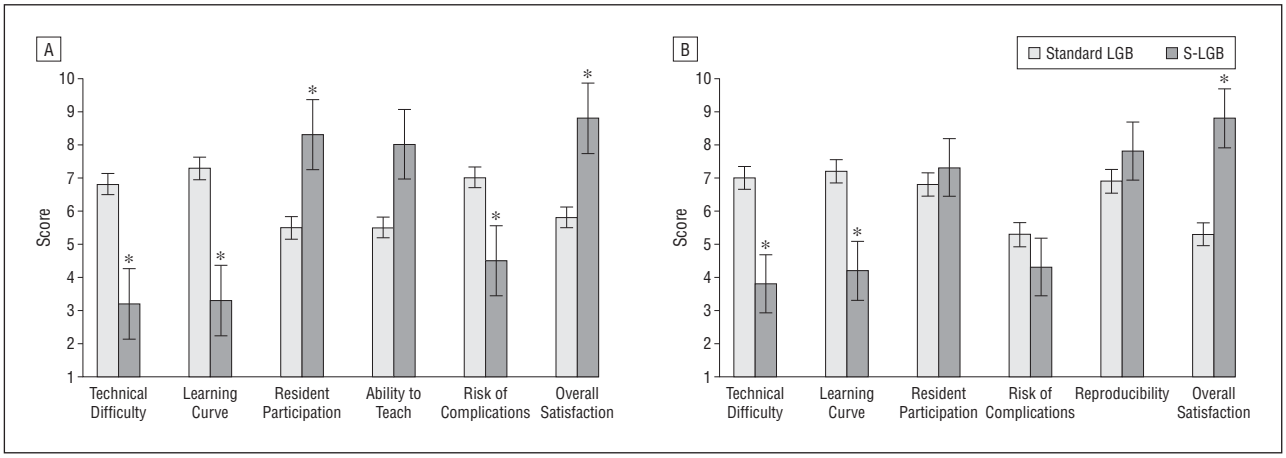

Figure 8. Results of survey comparing the standard laparoscopic gastric bypass technique with the simplified technique (S-LGB) for staff surgeons (A) and resident surgeons (B). The results are presented as mean (SD); 1 was the lowest score and 10 the highest. *$P < .05$.

dure, with increased complication rates often seen in the early experience.[2,3,16] There has been much discussion of methods to shorten or completely avoid the adverse effects of the learning curve, such as direct mentorship, simulator training, and the establishment of fellowship training programs.[9,11,17,18] Little is currently known about the impact of resident participation on the learning curve or patient outcomes.

Both open and laparoscopic bariatric surgery have become a critical component of resident training in general surgery.[19] Laparoscopic bariatric surgery provides an outstanding opportunity for residents to both observe and perform critical advanced laparoscopic tasks. However, it also represents a risk to patient safety and outcomes with the known technical difficulty and learning curve for LGB even among fully trained staff surgeons. In an analysis of 281 LGB procedures at an academic institution, DeMaria et al[13] gave the opinion that residents lack the technical ability to perform LGB or even to serve as first assistant. An additional concern is the impact of resident participation on costs and resource utilization. Resident participation has been found to significantly increase operative times and costs[20] but has not been found to increase patient morbidity.[21,22]

There are currently several described techniques for performing LGB. They are typically classified by the method used for the gastrojejunostomy: circular stapled, linear stapled, hand-sewn, or combination stapled and hand-sewn. The preferred technique for an individual surgeon or group is commonly chosen on the basis of personal preference, training experience and familiarity, available supplies, and cost. However, there are several additional factors that must be considered when choosing the optimal technique when surgical residents are active participants. These include technical difficulty, ability to teach the procedure, opportunity for resident participation, reproducibility, and ease of managing technical imperfections or complications.

Our data demonstrate that we were able to reduce an inherently complex operation into reproducible, logical steps that could be taught by experienced attending surgeons to practically any level of resident. We believe that the S-LGB technique offers a number of significant improvements and advantages over our previously used circular stapled technique (**Table 2**). We found that the application and use of articulating linear staplers during LGB was much easier for residents to grasp than the use

Table 2. Real and Perceived Advantages of the Simplified LGB Technique Compared With Our Previous Standard LGB Technique

Elimination of cost associated with circular staplers
Elimination of need to enlarge and dilate 1 incision for circular stapler introduction
Decreased patient complaints about pain and cosmesis
Decreased wound infections at this site
No persistent air leak during procedure from dilated fascial opening
Elimination of need to perform fascial closure of dilated fascial opening
No requirement for transoral anvil passage or additional gastrotomy for transgastric passage
Gastrojejunostomy performed before gastric pouch is completed
Ample room for additional manipulation or even complete revision
Easy to elevate and oppose edges of common enterotomy for stapled closure
No risk of anastomotic torsion due to slippage around anvil or circular stapler
No division of small-bowel mesentery required
Decreased bleeding events and risk
Decreased chance of compromising blood supply to end of Roux limb
Maintains biliopancreatic limb in upper abdominal field for easier anastomosis
Maintains mesenteric defect in more visible and accessible position for closure
Smaller mesenteric defect to close; possible decreased internal hernia risk
Common enterotomy closure is on excluded remnant rather than gastric pouch
Triple-stapled jejunojejunostomy technique decreases risk of inadvertent stenosis
Opportunity for resident to suture but anastomoses do not rely on intracorporeal suturing skill
Use of clips to secure mesenteric closure suture avoids difficult area of intracorporeal knot tying
Eliminates requirement to resect and remove proximal segment of Roux limb (“candy cane”)
Shorter operative times with less staff and resident fatigue or distraction
Shorter times for patient under general anesthesia and with abdominal insufflation

Abbreviation: LGB, laparoscopic gastric bypass.

of the circular stapler or advanced suturing techniques. We also found a decrease in the incidence of anastomotic strictures with the S-LGB technique. Our low S-LGB stricture incidence of 3.6% is in agreement with multiple previous studies comparing the linear with the circular stapled technique.[23-26] The short- and mid-term outcomes of the patients who underwent S-LGB have been excellent, with short hospital stays, minimal complications, and postoperative weight loss that compares favorably with reported standards.

One of our most striking findings was the significant decrease in operative times that was achieved with the S-LGB. We found a 45% reduction in operative time even when including the cases in which additional concurrent procedures were performed. For those undergoing S-LGB only, the reduction was 56%. Our mean operative times with this technique compare favorably with those in most reports in the literature of this procedure being performed by fully trained bariatric surgeons. DeMaria et al[13] reported mean times of 234 minutes in their early LGB experience and 162 minutes in the later phase. Another series comparing times of different anastomotic techniques reported 285 minutes for hand-sewn, 215 minutes for circular stapled, and 204 minutes for linear stapled techniques. Even among the patients in the S-LGB group undergoing concurrent procedures, the mean operative time of 116 minutes was significantly shorter than reported times for LGB in most series.[27] In addition, the short operative times in this series were achieved with full resident participation. This compares favorably with previous reports that have found increased operative times for LGB when residents assist (191 minutes)[28] or perform (150-250 minutes) the surgery.[29]

Our surveys showed that both resident and attending surgeons believed subjectively that the S-LGB technique reduced the difficulty of the operation and was overall a more satisfying technique than our previous standard technique. All residents and staff surgeons who completed the survey and who perform or plan to perform LGB selected the S-LGB technique as their preferred method. Although further study is needed to clarify the longer-term outcomes and durability of this technique, our results support the adoption of the S-LGB technique as safe, effective, and beneficial for performing LGB and training residents in minimally invasive surgery.

This study does have several limitations that should be noted. This was a relatively small sample with few data on outcomes beyond the first postoperative year and a median follow-up of only 8 months. The data for the comparison group of standard LGB procedures was obtained retrospectively and thus is subject to limitations in available data and incomplete or erroneous records. Although there was overlap in the periods during which the standard and simplified techniques were performed, the majority of the standard gastric bypasses were performed at an earlier time and not concurrently. The routine postoperative surveillance program we use for the first year may be more intense than many other programs and could affect the early outcomes and weight loss demonstrated. We do not have postoperative weight loss data for the standard technique group for comparison. Another possible source of confounding is that all the S-LGB procedures were done later in the surgeon's experience than the standard procedures. However, all procedures were performed by experienced surgeons who were past their learning curve. In addition, our results are strengthened by the fact that we compared outcomes from an established and practiced procedure (standard LGB) with those of a newly introduced and unfamiliar one (S-LGB).

Accepted for Publication: May 4, 2010.
Correspondence: Matthew J. Martin, MD, Department of Surgery, Madigan Army Medical Center, 9040-A Fitzsimmons Ave, Tacoma, WA 98431-1100 (matthew.martin1@amedd.army.mil).
Author Contributions: *Study concept and design:* Martin and Beekley. *Acquisition of data:* Martin, Eckert, Eggebroten, and Beekley. *Analysis and interpretation of data:* Martin, Eggebroten, and Beekley. *Drafting of the manuscript:* Martin and Eggebroten. *Critical revision of the manuscript for important intellectual content:* Martin, Eckert, Eggebroten, and Beekley. *Statistical analysis:* Martin and Eckert. *Administrative, technical, and material support:* Eckert, Eggebroten, and Beekley. *Study supervision:* Eggebroten and Beekley.
Financial Disclosure: None reported.
Disclaimer: This manuscript represents the opinions of the authors only and does not represent the views of the US Department of Defense, the Department of the Army, or Madigan Army Medical Center.
Previous Presentation: This paper was presented at the 81st Annual Meeting of the Pacific Coast Surgical Association; February 16, 2010; Kapalua, Hawaii; and is published after peer review and revision.

REFERENCES

1. Andrew CG, Hanna W, Look D, McLean AP, Christou NV. Early results after laparoscopic Roux-en-Y gastric bypass: effect of the learning curve. *Can J Surg.* 2006;49(6):417-421.
2. Ballantyne GH, Ewing D, Capella RF, et al. The learning curve measured by operating times for laparoscopic and open gastric bypass: roles of surgeon's experience, institutional experience, body mass index and fellowship training. *Obes Surg.* 2005;15(2):172-182.
3. Ballesta-López C, Poves I, Cabrera M, Almeida JA, Macías G. Learning curve for laparoscopic Roux-en-Y gastric bypass with totally hand-sewn anastomosis: analysis of first 600 consecutive patients. *Surg Endosc.* 2005;19(4):519-524.
4. Keller P, Romain B, Nicolae MA, Perrin P, Meyer C. Is laparoscopic gastric bypass a dangerous procedure during the early phase of the learning curve? a prospective study of the first 50 cases. *J Chir (Paris).* 2009;146(4):373-381.
5. See C, Carter PL, Elliott D, et al. An institutional experience with laparoscopic gastric bypass complications seen in the first year compared with open gastric bypass complications during the same period. *Am J Surg.* 2002;183(5):533-538.
6. Shikora SA, Kim JJ, Tarnoff ME, Raskin E, Shore R. Laparoscopic Roux-en-Y gastric bypass: results and learning curve of a high-volume academic program. *Arch Surg.* 2005;140(4):362-367.
7. Shin RB. Evaluation of the learning curve for laparoscopic Roux-en-Y gastric bypass surgery. *Surg Obes Relat Dis.* 2005;1(2):91-94.
8. Lublin M, Lyass S, Lahmann B, et al. Leveling the learning curve for laparoscopic bariatric surgery. *Surg Endosc.* 2005;19(6):845-848.
9. Kothari SN, Boyd WC, Larson CA, Gustafson HL, Lambert PJ, Mathiason MA. Training of a minimally invasive bariatric surgeon: are laparoscopic fellowships the answer? *Obes Surg.* 2005;15(3):323-329.
10. McIntyre T, Jones DB. Training methods for minimally invasive bariatric surgery. *Surg Technol Int.* 2005;14:57-60.
11. Abu-Hilal M, Vanden Bossche M, Bailey IS, et al. A two-consultant approach is a

safe and efficient strategy to adopt during the learning curve for laparoscopic Roux-en-Y gastric bypass: our results in the first 100 procedures. *Obes Surg*. 2007;17(6):742-746.
12. Gonzalez R, Haines K, Gallagher SF, Murr MM. Does experience preclude leaks in laparoscopic gastric bypass? *Surg Endosc*. 2006;20(11):1687-1692.
13. DeMaria EJ, Sugerman HJ, Kellum JM, Meador JG, Wolfe LG. Results of 281 consecutive total laparoscopic Roux-en-Y gastric bypasses to treat morbid obesity. *Ann Surg*. 2002;235(5):640-647.
14. Madan AK, Frantzides CT. Triple-stapling technique for jejunojejunostomy in laparoscopic gastric bypass. *Arch Surg*. 2003;138(9):1029-1032.
15. Mechanick JI, Kushner RF, Sugerman HJ, et al; American Association of Clinical Endocrinologists; Obesity Society; American Society for Metabolic & Bariatric Surgery. American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic & Bariatric Surgery medical guidelines for clinical practice for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient. *Obesity (Silver Spring)*. 2009;17(suppl 1):S1-S70, v.
16. Fernandez AZ Jr, DeMaria EJ, Tichansky DS, et al. Experience with over 3,000 open and laparoscopic bariatric procedures: multivariate analysis of factors related to leak and resultant mortality. *Surg Endosc*. 2004;18(2):193-197.
17. Buchwald H, Scopinaro N. Retiring the learning curve. *Obes Surg*. 2009;19(5):541-542.
18. Gonzalez R, Nelson LG, Murr MM. Does establishing a bariatric surgery fellowship training program influence operative outcomes? *Surg Endosc*. 2007;21(1):109-114.
19. Buchwald H, Williams SE. Bariatric surgery training in the United States. *Surg Obes Relat Dis*. 2006;2(1):52-56.
20. Babineau TJ, Becker J, Gibbons G, et al. The "cost" of operative training for surgical residents. *Arch Surg*. 2004;139(4):366-370.
21. Brebbia G, Carcano G, Boni L, et al. To teach and to learn in day surgery. The role of residents. *Int J Surg*. 2008;6(suppl 1):S56-S58.
22. Bakaeen FG, Dhaliwal AS, Chu D, et al. Does the level of experience of residents affect outcomes of coronary artery bypass surgery? *Ann Thorac Surg*. 2009;87(4):1127-1134.
23. Leyba JL, Llopis SN, Isaac J, Aulestia SN, Bravo C, Obregon F. Laparoscopic gastric bypass for morbid obesity—a randomized controlled trial comparing two gastrojejunal anastomosis techniques. *JSLS*. 2008;12(4):385-388.
24. Sczepaniak JP, Owens ML. Results of gastrojejunal anastomotic technique designed to reduce stricture. *Surg Obes Relat Dis*. 2009;5(1):77-80.
25. Korenkov M, Goh P, Yücel N, Troidl H. Laparoscopic gastric bypass for morbid obesity with linear gastroenterostomy. *Obes Surg*. 2003;13(3):360-363.
26. Shope TR, Cooney RN, McLeod J, Miller CA, Haluck RS. Early results after laparoscopic gastric bypass: EEA vs GIA stapled gastrojejunal anastomosis. *Obes Surg*. 2003;13(3):355-359.
27. Kim JJ, Schirmer B. Safety and efficacy of simultaneous cholecystectomy at Roux-en-Y gastric bypass. *Surg Obes Relat Dis*. 2009;5(1):48-53.
28. Hsu GP, Morton JM, Jin L, Safadi BY, Satterwhite TS, Curet MJ. Laparoscopic Roux-en-Y gastric bypass: differences in outcome between attendings and assistants of different training backgrounds. *Obes Surg*. 2005;15(8):1104-1110.
29. Rovito PF, Kreitz K, Harrison TD, Miller MT, Shimer R. Laparoscopic Roux-en-Y gastric bypass and the role of the surgical resident. *Am J Surg*. 2005;189(1):33-37.

INVITED CRITIQUE

Simplifying Surgical Technique

Good for the Goose and the Gander

Martin et al should be commended for developing a technique that simplifies one of the most advanced laparoscopic procedures performed in general surgery, that is, the laparoscopic Roux-en-Y gastric bypass. By simplifying the technique, they have not only made it so that residents can easily perform it but they have also shortened the operative time for the patient and reduced the operating room utilization cost for their institution. It seems that this is a perfect scenario.

In the past couple of decades, we have seen similar patterns in other aspects of general surgery in which simplified techniques also reduce operating time, with improved outcomes. Residents today have the luxury of applying a variety of technologies to simplify surgical technique: staplers, vessel-sealing systems, and biological glues, to name a few. As a result, we are graduating surgeons with limited experience in performing basic surgical techniques, such as hand-sewn bowel anastomosis, vessel ligation, and control of bleeding. These techniques are not necessarily of historical consequence, rather they are basic tools that we need when technology is not available or malfunctions.

As a laparoscopic surgeon, I am by definition a technophile. This is not my peeve. What concerns me is that we are graduating surgeons without the appropriate breadth of core surgical techniques. We are all aware that most residents today graduate having never performed or even seen an open cholecystectomy. In many institutions, the open appendectomy has also become a rarity. First- and second-year residents commonly perform these two basic laparoscopic procedures. Now, our residents are being trained to perform advanced laparoscopic surgery early in their residency. At the same time, they are at risk of losing the advanced technical skills required to safely perform these procedures, such as laparoscopic suturing and intracorporeal knot-tying.

No one has found a good solution to this problem. We certainly do not want to encourage the performance of more open cholecystectomies, because these patients are put at a disadvantage. So, is it appropriate to demand that more advanced laparoscopic procedures be performed with hand-sewn techniques, for example, as opposed to staplers—even if it may imply a longer operation or less resident involvement, with no immediate benefit to the patient? The answer is not yet clear to me.

Shirin Towfigh, MD

Author Affiliation: Department of Surgery, Cedars-Sinai Medical Center, Los Angeles, California.
Correspondence: Dr Towfigh, Department of Surgery, Cedars-Sinai Medical Center, 8635 W Third St, Ste 650W, Los Angeles, CA 90048 (shirin.towfigh@cshs.org).
Financial Disclosure: None reported.