

Review of Laparoscopic Sleeve Gastrectomy as a Treatment Strategy for Overweight Patients

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Abstract: This study was aim to overview the Laparoscopic Sleeve Gastrectomy as a treatment strategy for obese patients, we try to emphasize the advantage and technique of this surgical method based on evidence studies. We have performed a comprehensive search of electronic databases such as; MEDLINE/PubMed and EMBASE, for all relevant articles discussing the overweight treatment using laparoscopic sleeve gastrectomy published in English up to May, 2017. laparoscopic sleeve gastrectomy was connected with extended personnel time, blood loss, as well as hospital remain compared with laparoscopic flexible gastric banding. Both treatments have low temporary small morbidity as well as readmission prices without associated major morbidity, reoperations, or mortality. Both strategies are efficient and also secure for the treatment of severe excessive weight. However, laparoscopic sleeve gastrectomy supplies exceptional 2-year complete weight management. Lasting prospective randomized trials comparing both medical therapies in large groups of risky and significantly overweight patients are warranted.

Keywords: Laparoscopic Sleeve Gastrectomy, body mass index BMI.

1. INTRODUCTION

The incidence of obesity is steadily rising, and also it has actually been estimated that 40% of the United States population will certainly be overweight by the year 2025 if the present pattern proceeds ⁽¹⁾. The World Health Organization has actually recognized an epidemic of obesity throughout a lot of the developed and also establishing globe ⁽²⁾. A worrying indicator of the health and wellness crisis pertaining to the epidemic of obesity is that 15% of children as well as adolescents are obese (body mass index BMI > 95th percentile on the Centers for Disease Controls and also Prevention standard charts), and over 20% go to risk (BMI > 85 percentile) ⁽³⁾. In recent years there has been renewed rate of interest in the medical therapy of dark obesity in concomitance with the epidemic of obesity, and also application of the laparoscopic strategies to the field of bariatric surgical procedure. Bariatric surgical treatment proved reliable in offering weight management of big magnitude, modification of comorbidities and also outstanding short-term and long-lasting results ^(4,5), reducing general mortality and also providing a marked survival advantage ⁽⁶⁾.

The Laparoscopic Sleeve Gastrectomy (LSG) is being executed much more regularly and also is currently really "fashionable" amongst laparoscopic specialists involved in bariatric surgery. LSG is not a brand-new operation as it is the limiting part of a much more intricate malabsorptive bariatric treatment; i.e., the biliopancreatic diversion with duodenal switch (BPD-DS) ⁽⁷⁾. Gagner and also colleagues adjusted the BDP-DS to the laparoscopic strategy, and after that introduced the idea of the staged approach to extremely obese patients with the LSG being the first step ^(8,9). As LSG confirmed to be efficient in the temporary in achieving significant fat burning, it has actually been proposed by some to be utilized entirely as a bariatric treatment. LSG surgical procedure was done by 3 doctors experienced in bariatric surgery using a 5-trocar laparoscopic technique with the doctor standing on the ideal side of the patient as formerly defined ⁽¹⁰⁾. Among the mechanisms associated with weight loss observed after the LSG is the dramatic reduction of the capacity of the belly. The concept of limitation has actually been extensively used in bariatric surgery in vertical banded gastroplasty (VBG) and also LAGB. The distension of the little gastric bag in the LAGB procedure or VBG is meant to make up the sensation of early volume, improved satiation and also decreased hunger experienced by a patient after the consumption of small quantities of food. That using small calibre nasal-gastric tubes, as tiny as 30 Fr for LSG as suggested by Baltazar

et al⁽¹¹⁾, provides faster and enhanced weight-loss is in favour of the role of mechanical limitation as a crucial determinant in regards to fat burning that can be gotten with LSG⁽¹¹⁾.

Our present study was aim to overview the Laparoscopic Sleeve Gastrectomy as a treatment strategy for obese patients, we try to emphasize the advantage and technique of this surgical method based on evidence studies.

2. METHODOLOGY

We have performed a comprehensive search of electronic databases such as; MEDLINE/PubMed and EMBASE, for all relevant articles discussing the overweight treatment using laparoscopic sleeve gastrectomy published in English up to May, 2017. We used the search Mesh terms: “*bariatric surgery, obesity surgery, sleeve gastrectomy*”. Studies search were restricted to the English language, and human subjects. Furthermore, studies were searched using the references lists of found articles.

3. RESULTS

• LSG surgical method:

The LSG involves a longitudinal resection of the fundus, body, and antrum (approximately two-thirds gastrectomy), leaving a tubularized stomach (Figure1) conduit based on the lesser curve, a laparoscopic stapler, Endo GIA with a 60-mm cartridge (3.5-mm staple height, blue load) is used to divide the stomach parallel to and alongside a 46– 50 French bougie (placed against the lesser curve of the stomach). Although there are minor variations of the LSG procedure, in general 75%–80% of the greater curvature is excised, leaving a narrow stomach tube. A point on the greater curve, on the antrum, is chosen as the starting point. This has previously been described as ranging from 2 to 10 cm from the pylorus. The lesser sac is entered by opening the gastrocolic ligament. The short gastric vessels and the greater curvature ligaments (gastrosplenic and gastrocolic) are then divided with ultrasonic dissection to the left crus. The resection extends from the distal antrum (5 cm proximal to the pylorus) to the angle of His. The short gastric vessels and the greatercurvature ligaments (gastrosplenic and gastrocolic) are divided using ultrasonic dissection to complete the resection.^(8,11) The better curvature should be entirely freed up to the left crus of the diaphragm to completely resect the gastric fundus that harbours the ghrelin secreting cells of the stomach. The second action of the procedure is the longitudinal gastrectomy that "sleeves" the tummy to lower it to a narrow tube. A naso-gastric tube is utilized to get an accurate calibration as well as to prevent constriction of the gastropasty. There is no consensus about where to start the gastrectomy, and which calibre of the naso-gastric tube to make use of. Previous study suggested starting the gastrectomy 10 centimeters proximal to the pylorus (Figure 2)⁽⁹⁾. Baltazar el, suggested starting 4 cm from the pylorus in the case of DS, and just 2 cm from it if the LSG is intended as the single bariatric treatment⁽¹¹⁾. Different qualities of naso-gastric tubes have actually been reported by various writers from 32 Fr to 60 Fr^(9,11) The logical for beginning closer to the pylorus as well as making use of a small calibre bougie to style the gastric tube is to enhance the limiting personality of the treatment. The last volume of the gastric tube has actually been reported to be as little as 60 mL⁽¹¹⁾ and as big as 200 mL^(8,9). The staple line can after that be enhanced with sutures or Seamguard to minimize the rate of staple line leakage or blood loss (Figure 1)⁽¹²⁾. laparoscopic gastric sleeve gastrectomy is considered restrictive operations, surgical technique, postoperative care, as well as weight-loss mechanistic paths vary commonly. In addition, sleeve gastrectomy is regarded as an extra intrusive treatment since a minimum of two-thirds of the belly is removed. Gastric banding produces adjustable limitation to food and cravings reduction by vague systems, while sleeve gastrectomy generates weight reduction by ghrelin elimination, rapid gastric emptying, as well as other unidentified hormone mediated devices with almost full cravings suppression⁽¹³⁾.

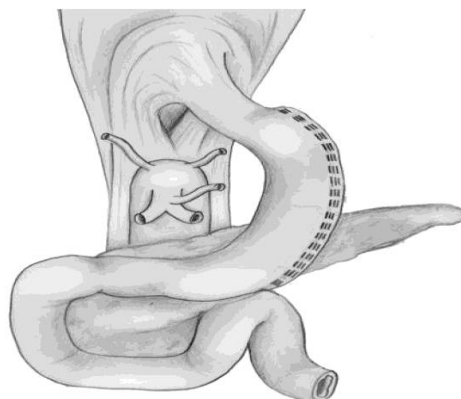


Figure 1: Laparoscopic sleeve gastrectomy technique

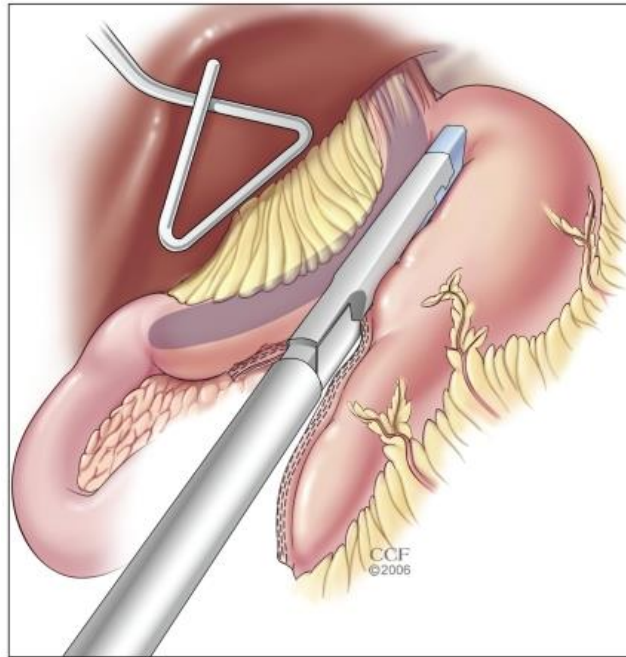


Figure2: A stapler is fired successively along the length of an intragastric bougie

○ **Advantage of LSG on other bariatric surgical technique on physiology of body:**

The hormone modifications caused by LSG vary from those located after a totally limiting treatment as laparoscopic Roux-en-Y Gastric ByPass (LRYGBP). Peptide hormonal agent mostly generated in the fundus of the stomach, is intended to be involved in the devices managing cravings as well as has actually been an emphasis of interest in an expanding number of lately released papers⁽¹⁴⁾. Ghrelin is secreted by the endocrine cells of the stomach (X/A-like cells), which stay in the oxyntic glands of the gastric fundus^(15,16). Gastric ghrelin generating cells are in contact with the basolateral membrane layer beside the blood-stream and a lot of them do not be available in contact with gastric web content⁽¹⁷⁾. The gastric fundus has 10 to 20 times extra ghrelin each 1 × g of cells compared to the duodenum^(15,16,18) with reducing focus being discovered in the jejunum and also ileum^(16,19). Ghrelin has actually been likewise located in different additional tissues in really low concentrations such as the lungs, kidney, pancreatic islands, gonads, adrenal cortex, placenta and also others⁽²⁰⁾. Ghrelin regulates the secretion of development hormonal agent release and is a potent orexigenic (appetite-stimulating) peptide. This last result of ghrelin is mediated by the activation of ghrelin receptors in the hypothalamus/pituitary area⁽²¹⁾. There is some evidence that body weight is the major determinant in the long-term regulation of the plasma focus of ghrelin⁽²²⁾. Accordingly, it has actually been shown that plasma focus of ghrelin is boosted in the case of unfavorable energy balance scenarios such as low-calorie diet regimens⁽²²⁾, chronic exercise, cancer anorexia, and also anorexia nervosa, and also are decreased in favorable balance circumstances such as weight reclaim after overfeeding, or throughout the weight recovery phase of anorexia or in overweight patients^(23,24). Nevertheless as no alleged devices have actually been clarified until now to explicate the changes in the plasma degrees of ghrelin in the long-term, further studies are necessary to define this concern⁽²⁴⁾.

We have actually included 3 research studies examined (total of 130 patients)^(25,26,27), underwent LSG surgical treatment and also LASGB, as well as LSG was done as the single procedure; i.e. not adhered to by various other kinds of bariatric procedures. Nevertheless, one of these patients⁽²⁵⁾ went through a laparoscopic gastric bypass one year after LSG since he failed to accomplish an acceptable weight loss. In the other studies, registering a total amount of 198 patients (28,29), LSG was planned as the primary step of a combined approach to accomplish a preliminary weight-loss in "difficult" patients with the 2nd step being a LRYGBP or DS. Amongst the 198 patients undergoing the LSG as the first step of the consolidated technique technique, 51 patients finally undertook the second procedure: 36 had a LRYGBP and 15 a DS. Surprisingly, in the 3 researches where LSG was performed as a first step treatment, only a part of the initially configured second treatments were ultimately carried out. It can be guessed that a minimum of in several of the situations the weight-loss accomplished after LSG alone was satisfying^(27,28,29). Mean personnel time was plainly reported in 4 studies^(25,27,28,29) ranging from 70 minutes (25) to 143 minutes⁽²⁹⁾. As expected, the personnel time is much longer in patients with high

BMI. Complete data about excess weight loss are reported in 3 research studies^(25,26,27). This is a primary issue as the primary result of bariatric surgical procedure is excess weight reduction, and also an offered treatment cannot be assessed appropriately if the useful results are not reported. Mean excess fat burning ranged from 52.8% (subsequent 6 mo)⁽²⁷⁾ to 83.3% (subsequent 12 mo). Three postoperative deaths were tape-recorded for 328 patients (fatality price of 0.9%) and a total amount of 34 major and also minor complications were reported (morbidity 10.3%). Fifteen of these were taken into consideration small difficulties: 5 short-term renal failings not needing dialysis, 5 patients calling for ventilatory support for > 24 h, 1 pulmonary atelectasis, 1 instance of extended postoperative vomiting dealt with conservatively and also automatically fixed, 3 dehydrations. By excluding small issues, an overall of 19 major difficulties occurred (major problem price 5.8%). Significant problems managed conservatively consisted of 4 cases of staple-line leaks, 5 strictures of the gastric plasty, 2 cases of blood loss and also 2 cases of lung embolus^(26,28,29).

Milone and colleagues⁽³⁰⁾ retrospectively compared their experience with 20 LSG patients (BMI > 50) to that of 57 BIB historical controls with similar BMI defined in 2 researches⁽³⁰⁾. At 6 months, the LSG team experienced a better excess fat burning than did those in the 2 BIB teams (34.9% v. 26.1% as well as 21%). Standard BMI as well as weight were equivalent in between the LSG as well as BIB patients, however the LSG patients experienced a 15.9 reduction in mean BMI versus 9.4 and 6.4 in the BIB patients. Each patient in the LSG as well as BIB group had improvement in comorbidities such as hypertension, osteoarthritis as well as sleep apnea. Amongst the 20 LSG patients, the only problem was a trocar site infection. 4 (7%) patients in the BIB team needed removal of the balloon as well as 1 patient automatically removed the balloon in their stool. Other kept in mind problems consisted of severe throwing up and dehydration in 2 patients⁽³⁰⁾.

o **Safety and efficacy of LSG:**

Early safety and security as well as effectiveness of LSG was checked out prospectively by Mognol et alia⁽³¹⁾ in 10 patients (imply BMI 64, variety 61-- 80, ordinary age 42.7 year). Patients had an average of 3.4 comorbidities, consisting of high blood pressure (50%) and also sleep apnea (90%). Mean operative time was 120 (range 90 - 150) minutes and the ordinary size of remain in healthcare facility was 7.2 days. No early deaths or problems were reported. At 1-year after LSG, an excess weight-loss of 51% and also a BMI decline to 41 was reported in the 30% of patients who completed follow-up.

Comparable results were shown in a retrospective study by Baltasar et al⁽³²⁾ including 31 patients who had actually undergone LSG for various reasons. Seven patients were super-super obese (mean BMI 65, array 61 - 74) as well as underwent LSG as a first stage towards completion BPD-DS. An additional 23 patients had considerable comorbidities or intraoperative searchings for that did not make complete BPD-DS suggested. One patient was transformed from LAGB to LSG owing to severe symptoms from the initial treatment. There were no circumstances of deep capillary thrombosis or pulmonary embolism, leak or pneumonia. However, there were 2 circumstances of trocar-related intra-abdominal blood loss, with one leading to fatality. Mean excess fat burning varied from 56.1% (at 4 - 27 months) in the super-obese patients to 62.3% (3-- 27 months' follow-up) in the lower BMI patients with significant comorbidities. The lengthiest published follow-up was executed by Himpens et al⁽³³⁾ who released a possible randomized research entailing 40 patients undergoing LSG. With a median preliminary BMI of 39 (range 30 to 53), their 3-year follow-up information found a median fat burning of 29.5 kg (variety 1 to 48), median BMI reduction of 27.5 kg/m² (variety 0 to 48) and a mean percent of excess weight-loss of 66% (range-- 3.1 to 152.4) after LSG.

4. CONCLUSION

Laparoscopic sleeve gastrectomy was connected with extended personnel time, blood loss, as well as hospital remain compared with laparoscopic flexible gastric banding. Both treatments have low temporary small morbidity as well as readmission prices without associated major morbidity, reoperations, or mortality. Both strategies are efficient and also secure for the treatment of severe excessive weight. However, laparoscopic sleeve gastrectomy supplies exceptional 2-year complete weight management. Lasting prospective randomized trials comparing both medical therapies in large groups of risky and significantly overweight patients are warranted. LSG has now been shown to result in sufficient early weight management and may be taken into consideration as a clear-cut bariatric medical monitoring choice. Moreover, with a significant complication rate varying from 2.9% - 14%, LSG for morbid weight problems continues to be a significant technological endeavor.

REFERENCES

- [1] Kopelman PG. Obesity as a medical problem. *Nature*. 2000; 404:635–643.
- [2] World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. *World Health Organ Tech Rep Ser*. 2000;894:1–253.
- [3] Hoppin AG. Obesity and the liver: developmental perspectives. *Semin Liver Dis*. 2004;24:381–387.
- [4] Buchwald H, Avidor Y, Braunwald E, Jensen MD, Pories W, Fahrenbach K, Schoelles K. Bariatric surgery: a systematic review and meta-analysis. *JAMA*. 2004;292:1724–1737.
- [5] Maggard MA, Shugarman LR, Suttorp M, Maglione M, Sugerman HJ, Livingston EH, Nguyen NT, Li Z, Mojica WA, Hilton L, et al. Meta-analysis: surgical treatment of obesity. *Ann Intern Med*. 2005;142:547–559.
- [6] Christou NV, Sampalis JS, Liberman M, Look D, Auger S, McLean AP, MacLean LD. Surgery decreases long-term mortality, morbidity, and health care use in morbidly obese patients. *Ann Surg*. 2004;240:416–423; discussion 423–424.
- [7] Hess DS, Hess DW, Oakley RS. The biliopancreatic diversion with the duodenal switch: results beyond 10 years. *Obes Surg*. 2005;15:408–416.
- [8] Ren CJ, Patterson E, Gagner M. Early results of laparoscopic biliopancreatic diversion with duodenal switch: a case series of 40 consecutive patients. *Obes Surg*. 2000;10:514–523; discussion 524.
- [9] Regan JP, Inabnet WB, Gagner M, Pomp A. Early experience with two-stage laparoscopic Roux-en-Y gastric bypass as an alternative in the super-super obese patient. *Obes Surg*. 2003;13:861–864.
- [10] Ahluwalia, J.S., Chang, P.C., Tai, C.M. et al. Comparative study between laparoscopic adjustable gastric banded plication and sleeve gastrectomy in moderate obesity—2 year results. *Obes Surg*. 2016; 26: 552–557
- [11] Baltasar A, Serra C, Perez N, Bou R, Bengochea M, Ferri L. Laparoscopic sleeve gastrectomy: a multi-purpose bariatric operation. *Obes Surg*. 2005;15:1124–1128
- [12] Consten EC, Gagner M, Pomp A, Inabnet WB. Decreased bleeding after laparoscopic sleeve gastrectomy with or without duodenal switch for morbid obesity using a stapled buttressed absorbable polymer membrane. *Obes Surg*. 2004;14:1360–1366.
- [13] Peterli R, Wolnerhanssen B, Peters T, et al. Improvement in glucose metabolism after bariatric surgery: comparison of laparoscopic Roux-en-Y gastric bypass and laparoscopic sleeve gastrectomy: a prospective randomized trial. *Ann Surg*. 2009;250:234–241
- [14] Lee H, Te C, Koshy S, Teixeira JA, Pi-Sunyer FX, Laferrere B. Does ghrelin really matter after bariatric surgery? *Surg Obes Relat Dis*. 2006;2:538–548.
- [15] Date Y, Kojima M, Hosoda H, Sawaguchi A, Mondal MS, Suganuma T, Matsukura S, Kangawa K, Nakazato M. Ghrelin, a novel growth hormone-releasing acylated peptide, is synthesized in a distinct endocrine cell type in the gastrointestinal tracts of rats and humans. *Endocrinology*. 2000;141:4255–4261.
- [16] Ariyasu H, Takaya K, Tagami T, Ogawa Y, Hosoda K, Akamizu T, Suda M, Koh T, Natsui K, Toyooka S, et al. Stomach is a major source of circulating ghrelin, and feeding state determines plasma ghrelin-like immunoreactivity levels in humans. *J Clin Endocrinol Metab*. 2001;86:4753–4758.
- [17] Sakata I, Nakamura K, Yamazaki M, Matsubara M, Hayashi Y, Kangawa K, Sakai T. Ghrelin-producing cells exist as two types of cells, closed- and opened-type cells, in the rat gastrointestinal tract. *Peptides*. 2002;23:531–536.
- [18] Kojima M, Hosoda H, Date Y, Nakazato M, Matsuo H, Kangawa K. Ghrelin is a growth-hormone-releasing acylated peptide from stomach. *Nature*. 1999;402:656–660.
- [19] Cummings DE, Purnell JQ, Frayo RS, Schmidova K, Wisse BE, Weigle DS. A preprandial rise in plasma ghrelin levels suggests a role in meal initiation in humans. *Diabetes*. 2001;50:1714–1719.
- [20] van der Lely AJ, Tschop M, Heiman ML, Ghigo E. Biological, physiological, pathophysiological, and pharmacological aspects of ghrelin. *Endocr Rev*. 2004;25:426–457.

- [21] Sun Y, Wang P, Zheng H, Smith RG. Ghrelin stimulation of growth hormone release and appetite is mediated through the growth hormone secretagogue receptor. *Proc Natl Acad Sci USA*. 2004;101:4679–4684.
- [22] Cummings DE, Weigle DS, Frayo RS, Breen PA, Ma MK, Dellinger EP, Purnell JQ. Plasma ghrelin levels after diet-induced weight loss or gastric bypass surgery. *N Engl J Med*. 2002;346:1623–1630.
- [23] Zigman JM, Elmquist JK. Minireview: From anorexia to obesity--the yin and yang of body weight control. *Endocrinology*. 2003;144:3749–3756.
- [24] Otto B, Cuntz U, Fruehauf E, Wawarta R, Folwaczny C, Riepl RL, Heiman ML, Lehnert P, Fichter M, Tschop M. Weight gain decreases elevated plasma ghrelin concentrations of patients with anorexia nervosa. *Eur J Endocrinol*. 2001;145:669–673.
- [25] Moon Han S, Kim WW, Oh JH. Results of laparoscopic sleeve gastrectomy (LSG) at 1 year in morbidly obese Korean patients. *Obes Surg*. 2005;15:1469–1475.
- [26] Himpens J, Dapri G, Cadiere GB. A prospective randomized study between laparoscopic gastric banding and laparoscopic isolated sleeve gastrectomy: results after 1 and 3 years. *Obes Surg*. 2006;16:1450–1456.
- [27] Roa PE, Kaidar-Person O, Pinto D, Cho M, Szomstein S, Rosenthal RJ. Laparoscopic sleeve gastrectomy as treatment for morbid obesity: technique and short-term outcome. *Obes Surg*. 2006;16:1323–1326.
- [28] Silecchia G, Boru C, Pecchia A, Rizzello M, Casella G, Leonetti F, Basso N. Effectiveness of laparoscopic sleeve gastrectomy (first stage of biliopancreatic diversion with duodenal switch) on co-morbidities in super-obese high-risk patients. *Obes Surg*. 2006;16:1138–1144.
- [29] Cottam D, Qureshi FG, Mattar SG, Sharma S, Holover S, Bonanomi G, Ramanathan R, Schauer P. Laparoscopic sleeve gastrectomy as an initial weight-loss procedure for high-risk patients with morbid obesity. *Surg Endosc*. 2006;20:859–863.
- [30] Milone L, Strong V, Gagner M. Laparoscopic sleeve gastrectomy is superior to endoscopic intragastric balloon as a first stage procedure for super-obese patients (BMI > or =50) *Obes Surg*. 2005;15:612–7.
- [31] Mognol P, Chosidow D, Marmuse JP. Laparoscopic sleeve gastrectomy as an initial bariatric operation for high-risk patients: initial results in 10 patients. *Obes Surg*. 2005;15:1030–3.
- [32] Baltasar A, Serra C, Perez N, et al. Laparoscopic sleeve gastrectomy: a multi-purpose bariatric operation. *Obes Surg*. 2005;15:1124–8.
- [33] Himpens J, Dapri G, Cadière GB. A prospective randomized study between laparoscopic gastric banding and laparoscopic isolated sleeve gastrectomy: results after 1 and 3 years. *Obes Surg*. 2006;16:1450–6.