Surgery for Obesity and Related Diseases 13 (2017) 1652–1657

SURGERY FOR OBESITY AND RELATED DISEASES

ASMBS Guidelines/Statements

American Society for Metabolic and Bariatric Surgery updated position statement on sleeve gastrectomy as a bariatric procedure

Mohamed Ali, M.D.[a], Maher El Chaar, M.D.[b], Saber Ghiassi, M.D.[c], Ann M. Rogers, M.D.[d,*]; for the American Society for Metabolic and Bariatric Surgery Clinical Issues Committee

[a]Department of Surgery, University of California-Davis Medical Center, Sacramento, California
[b]Department of Surgery, Division of Bariatric and Minimally Invasive Surgery, the Medical School of Temple University/St Luke's University Health Network, Allentown, Pennsylvania
[c]Department of Surgery, Yale University School of Medicine, New Haven, Connecticut
[d]Division of Minimally Invasive and Bariatric Surgery, Penn State Hershey Medical Center, Hershey, Pennsylvania

Received August 4, 2017; accepted August 9, 2017

The American Society for Metabolic and Bariatric Surgery (ASMBS) has previously published 3 position statements on the use of sleeve gastrectomy (SG) as a bariatric procedure [1–3]. These position statements were developed in response to inquiries made to the ASMBS by patients, physicians, hospitals, health insurance payors, the media, and others regarding this newer procedure that requires ongoing evaluation and evidence-based scrutiny. In 2012, the ASMBS published a position statement recognizing SG as an acceptable primary bariatric procedure option [3]. Since that time, a number of high-quality publications have supported the use of SG by demonstrating durable weight loss, improved medical co-morbidities, and relatively low surgical risk. The Clinical Issues Committee and Executive Council of ASMBS have determined that the emergence of SG as the most commonly performed bariatric procedure in the world today warrants an updated statement to compile available data to facilitate sharing of the evidence, which supports the value of SG, and to review available evidence regarding issues that may limit application of the procedure. Recommendations are made based on published, peer-reviewed scientific evidence and expert opinion. This statement is not intended to be, and should not be construed as, stating or establishing a local, regional, or national standard of care for any bariatric procedure.

*Correspondence: Ann M. Rogers, M.D., Division of Minimally Invasive and Bariatric Surgery, Penn State Hershey Medical Center, Hershey, PA, 17033.

E-mail: arogers@pennstatehealth.psu.edu

Comparative studies of weight loss

Previous ASMBS statements confirmed that primary SG could effectively produce significant weight loss. More recent studies have provided information comparing various “accepted” ASMBS-approved surgical procedures with SG. Among these comparisons, Roux-en-Y gastric bypass (RYGB) is considered by many to be the gold standard procedure for weight loss, and therefore comparisons between SG and RYGB may be seen as useful.

Several studies demonstrate that SG and RYGB provide more comparable weight loss than is seen after the adjustable gastric band (AGB) or nonsurgical interventions [4–9]. Leyba et al. [4,5] reported that SG and RYGB produced similar weight loss at 1 and 5 years of follow-up. Peterli et al. [6] reported early weight loss at 1 year after surgery to be comparable between SG and RYGB in a randomized clinical trial. Vidal et al. [7] reported no significant differences between SG and RYGB in terms of excess weight loss (EWL) observed at 4 years of follow-up. Similarly, Lakdawala reported no significant early (1 yr) difference in EWL between SG and RYGB [8]. Lim et al. [9], although finding superior EWL after RYGB compared with SG at 1 year, reported that the 2 procedures yielded similar weight loss results in the longer term of up to 5 years. In a RT of patients with a body mass index (BMI) <50 kg/m^2, Kehagias et al. [10] found that SG yielded greater early weight loss, but this difference resolved over time, resulting in no weight loss difference between the 2 procedures by 3

http://dx.doi.org/10.1016/j.soard.2017.08.007

years of follow-up. Karamanakos et al. [11] also noted greater weight loss with SG than RYGB at 1 year, associated with a statistically significant decrease in fasting ghrelin levels after SG but not after RYGB, although the SG group was younger than the RYGB group, which could be a confounding factor.

Other groups have reported that RYGB provides superior weight loss to that seen after SG [12–16]. In a meta-analysis of the 2-year outcomes of bariatric surgery, Zhang et al. [12] reported that patients undergoing RYGB achieved a lower BMI and greater %EWL compared with SG. A retrospective cohort study of US military veterans undergoing RYGB or SG compared with matched patients treated without surgery demonstrated that patients undergoing RYGB lost a mean of 27.5% of weight, compared with 17.8% in the SG group [13]. The surgical groups in this study, however, were not well matched because the SG patients were older, more likely to be male, and more likely to have diabetes, thus calling into question these results.

In a randomized trial (RT) conducted by Zhang et al. [14] in China, SG and RYGB led to similar weight loss at 1 year, but RYGB was found to be superior at 5 years. El Chaar et al. [15] reported greater overall weight loss with RYGB at 2 years postoperatively. In this study, the subset of patients with BMI <40 kg/m^2 yielded similar weight loss with both procedures at 1 year, but EWL was less 2 years after SG compared with RYGB. In studies of super-obese patients (BMI ≥50 kg/m^2), several studies have demonstrated significantly greater weight loss and percent total weight loss with RYGB than with SG [16,17].

In summary, studies comparing weight loss after SG and after RYGB demonstrate variable differences between the 2 procedures with no reliable conclusion regarding which operation produces the greatest weight loss early after surgery. However, the weight of current evidence appears to support the conclusion that RYGB provides greater EWL compared with SG beyond the first year.

Comparative studies regarding co-morbidity improvements

Regarding improvement of weight-related conditions, previous RTs have generally shown similarity between SG and RYGB and the superiority of both procedures compared with AGB [18] The results of 2 new RTs comparing SG with RYGB showed similar weight loss outcomes and improvements in type 2 diabetes (T2D) and quality of life scores [6,19]. In another RT, the Surgical Treatment and Medications Potentially Eradicate Diabetes Efficiently trial, Schauer et al. [20] reported 5-year outcomes comparing the effectiveness of SG and RYGB combined with medical therapy versus intensive medical therapy alone for the treatment of T2D. The results showed significant superiority of both procedures over intensive medical therapy alone in terms of glycemic control; weight loss; reduction of medication use for T2D, lipids, and hypertension (HTN); renal function; and quality of life scores. There was no significant difference between SG and RYGB in terms of improvement of glycemic control, HTN, or lipid profiles, but there was a significant difference favoring RYGB in 5-year weight loss. The outcomes and conclusions of these 3 RTs are summarized in Table 1.

In a large case-control study matched for age, BMI, and sex, Boza et al. compared 811 SG patients with 786 RYGB patients; the improvement of T2D, HTN, and lipid profiles was similar for both groups at 1 year after surgery [21]. In a report from the Michigan Bariatric Surgery Collaborative comparing outcomes of SG, RYGB, and AGB, SG was associated with remission rates of 66% for T2D and 40% for hyperlipidemia at 1 year postoperatively. These rates were significantly greater than rates with AGB but less than with RYGB. Remission of HTN (40%) and obstructive sleep apnea (57%) after SG was similar to that with RYGB and superior to that with AGB [22].

Four meta-analyses comparing SG with RYGB have been published since 2012, 2 of which reported similar remission of T2D [12,23] and 2 of which reported superior outcomes with RYGB for several co-morbidities [24,25]. Yip et al. [23] analyzed 33 studies (N = 1375), including 3 RTs, 18 prospective, and 12 retrospective studies, and concluded there was no significant difference in T2D remission at 1 and 3 years (68% and 80% with SG versus 76% and 81% with RYGB, respectively). In a meta-analysis of 32 randomized and nonrandomized studies (N = 6256) with up to a 5-year follow-up, Li et al. [25] found that RYGB conferred significantly greater remission or improvement of T2D, HTN, gastroesophageal reflux disease (GERD), arthritis, and hypercholesterolemia but a higher risk for complications and reoperation than with SG.

Several cohort studies of SG have reported mid- to long-term improvements in co-morbidities up to 7 years after surgery. Lemanu et al. [26] reported a 42.9% remission of T2D at 5 years after SG and improvement in another 35.7% [26], while others have reported T2D remission rates of 76.9% to 100% at 5 years [27–30] and 83.8% at 7 years [31]. The reduction in glycated hemoglobin after SG averages 1.7% to 2.37% at 1 year, 1.8% to 2.5% at 3 years, and 1.4% at 5 years after surgery [19,20,27].

Comparative studies of surgical risk

A recent meta-analysis of 6 randomized controlled trials comprising 695 patients and comparing complication rates after SG and RYGB found that SG was associated with significantly fewer major complications within 30 days of surgery. There was a nonsignificant trend toward fewer minor complications after SG compared with RYGB. Neither procedure was found to have a higher readmission rate, reoperation rate, or 30-day mortality [32]. The general range of 30-day mortality and morbidity for SG in the

Table 1
Randomized trials comparing SG and RYGB

Investigators	Procedures (n)	Preoperative BMI (kg/m^2)	Follow-up, mo	Weight loss	Conclusions
Peterli et al. [6]	SG (107)	43.6	36 mo for weight loss	63.3%EBMIL	SG: shorter operation time, fewer complications.
	RYGB (110)	44.2	12 mo for co-morbidities	72.8% EBMIL	RYGB: more effective for GERD
					Equivalent weight loss, co-morbidity response, quality of life at 12 mo
Keidar et al. [18]	SG (18)	42.5	12	28.4% TBW	RYGB and SG are equivalent in weight loss and HbA1C effect at 12 mo
	RYGB (19)	42		25.9% TBW	
Schauer et al. [19]	SG (47)	36.1	60	18.6% TBW	Bariatric surgery is superior to intensive medical therapy alone in weight loss, glycemic control, medication reduction, and quality of life improvement.
	RYGB (49)	37.1		23.2% TBW	
	Medication (38)	36.4		5.3% TBW	

SG = sleeve gastrectomy; RYGB = Roux-en-Y gastric bypass; BMI = body mass index; EMBIL = excess body mass index loss; TBW = total weight; GERD = gastroesophageal reflux disease; HbA1C = glycated hemoglobin.

current literature is 0% to 1.2% and 0% to 17.5%, respectively [33]. Young et al. [34] analyzed 24,117 patients from the American College of Surgeons National Surgical Quality Improvement Program database in the years 2010 to 2011, 4945 of whom underwent SG, and 19,172 of whom underwent RYGB. In this analysis, there were a significantly greater number of RYGB patients with diabetes, chronic obstructive pulmonary disease, HTN, and smoking. However, the risk-adjusted complication rate was still significantly lower overall among SG patients. The 30-day mortality rates of SG (.1%) versus RYGB (.15%) were both low; because of the small numbers, risk-adjusted mortality rates could not be compared [34].

Aminian et al. [35] reported on 5871 SG cases from the National Surgical Quality Improvement Program database over the period 2011 to 2012: The 30-day mortality rate was .5%, and the overall rate of serious adverse events was 2.4%. Based on their analysis, they identified several factors that were predictive of adverse events after SG, including a history of congestive heart failure, male sex, T2D, chronic steroid use, increasing BMI, elevated preoperative total bilirubin level, and low preoperative hematocrit [35]. A similar National Surgical Quality Improvement Program study of 1005 bariatric patients ≥65 years of age showed a 30-day mortality rate of .6% for both SG and RYGB and an overall 30-day morbidity rate of 9% for SG and 9.1% for RYGB [36]. The BariSurg multicenter randomized controlled trial in which 248 patients have been enrolled and blinded to undergo SG or RYGB will likely provide better information as to the discrete differences in outcomes after these 2 procedures [33].

One rare complication of laparoscopic surgery is portal venous thrombosis (PVT). In a prospectively collected database comprising 6 bariatric centers and 5706 weight loss surgery (WLS) patients, there were 17 patients (.3%) with PVT, of whom 16 (94.1%) had undergone SG [37]. This particular complication requires heightened clinical suspicion on the part of surgeons because it will not be seen on computed tomography scans without intravenous contrast. Because PVT may prove to be more common after SG than after other forms of WLS, this particular topic merits further study. The mechanism of PVT after SG remains a matter of speculation at this time, and no recommendations are appropriate regarding anticoagulation for prevention of this rare complication.

Current data—SG as a WLS option for adolescents

Given the growing prevalence of severe obesity among adolescents and the fact that adolescent obesity predicts adult obesity, WLS among teens is becoming more accepted [38]. In addition, based on safety and efficacy data, there is a trend toward SG as the procedure of choice for adolescents, although both RYGB and SG are routinely performed in teen WLS programs [39]. One multicenter, prospective study of WLS in adolescents included 161 RYGB patients and 67 SG patients. Among the RYGB patients there was a mean 28% total weight loss at 3 years after surgery, and among SG patients, 26%. There were no mortalities attributable to WLS and the major complication rate was 8%. Nutritional deficiencies were seen as with adult populations, so the need for long-term follow-up was emphasized [40]. As there is almost no literature on the outcomes of adults who underwent WLS as teens, this area merits further study.

Current data—SG and GERD

The effect of SG on GERD is controversial and, as a result, has been the subject of extensive study. The existence and severity of preoperative GERD should be considered when helping patients select the best surgical option. GERD is also an important postoperative outcome variable after SG. In general, RYGB is considered an effective antireflux procedure in patients with medically complicated obesity and GERD. In contrast, early data suggested that SG might worsen GERD, and many recommended caution in offering SG to patients with GERD, especially when it was severe [36]. A growing body of literature, however, indicates that the rates of development of de novo GERD and worsening of preoperative GERD after SG may be lower than previously thought [28]. Although controversial, there is little evidence beyond expert opinion to support the notion that preexisting GERD should exclude patients from undergoing SG.

Numerous publications have addressed the persistence or development of GERD after SG. At the time of the 2012 updated sleeve position statement, some studies had reported a significant incidence of de novo GERD after SG [41–45], but more recent systematic reviews of this topic are inconsistent [46,47]. De novo GERD has been reported to occur in 8% to 11% of patients after SG [28,48–50], although 1 study reported an incidence of 26.7% [30]. One study at 5 years after SG reported de novo GERD in only 7.4% of patients [48]. Thereaux et al. [50] found that when patients before and 6 months after SG were assessed by pH measurement, two thirds of patients showed evidence of acid reflux after SG, including some who were asymptomatic. However, in patients with pre-existing GERD, SG did not increase the measured abnormalities [50].

In the presence of hiatal hernia, SG with simultaneous hiatal hernia repair improved symptoms or reduced the need for medications in one third of patients with pre-existing GERD, while de novo reflux developed in 15.6% of previously asymptomatic patients [51]. One study of 110 SG patients undergoing routine pre- and postoperative upper endoscopy at a mean 58 months of postsurgical follow-up reported a 17.2% rate of newly diagnosed Barrett esophagus and a significant increase in erosive esophagitis, neither of which correlated with severity of symptoms [52].

Improvement in GERD symptoms has also been reported after SG. A large retrospective review, the Bariatric Outcomes Longitudinal Database from 2007 to 2010 with 4832 patients found the prevalence of preoperative GERD to be 44.5%. After SG, 15.9% of these patients reported resolution of symptoms [47]. SG has been reported to lead to remission of GERD symptoms in 53% of patients at 5 years [28] and 64.7% of patients at 7 years [31]. In comparison to RYGB, however, patients are more likely to require acid reduction medications after SG [53].

Finally, while expert consensus appears to support the preferential use of RYGB as superior to SG in the presence of Barrett esophagus, not all authors consider this metaplastic change to be an absolute contraindication to the use of SG as a weight loss option [54]. Given significant ongoing controversy related to differences in reported outcomes of GERD in SG patients, further study of this issue, including evaluation of long-term endoscopic findings after SG, is needed.

Summary and recommendations

Substantial long-term outcome data published in the peer-reviewed literature, including studies comparing outcomes of various surgical procedures, confirm that SG provides significant and durable weight loss, improvements in medical co-morbidities, improved quality of life, and low complication and mortality rates for obesity treatment. In terms of initial early weight loss and improvement of most weight-related co-morbid conditions, SG and RYGB appear similar. The effect of SG on GERD, however, is less clear, because GERD improvement is less predictable and GERD may worsen or develop de novo. Preoperative counseling specific to GERD-related outcomes is recommended for all patients undergoing SG.

The ASMBS recognizes SG as an acceptable option for a primary bariatric procedure or as a first-stage procedure in high-risk patients as part of a planned, staged approach. As with any bariatric procedure, long-term weight regain can occur after SG and may require one or more of a variety of reinterventions. Informed consent for SG as a primary procedure should be consistent with the consent provided for other bariatric procedures and, as such, should include the risk of long-term weight regain. In addition, as with all currently recognized bariatric procedures, surgeons performing SG are encouraged to prospectively collect, analyze, and report their outcome data in peer-reviewed scientific forums.

Sleeve gastrectomy position statement and standard of care

This position statement is not intended to provide inflexible rules or requirements of practice and is not intended, nor should it be used, to state or establish a local, regional, or national legal standard of care. Ultimately, there are various appropriate treatment modalities for each patient, and surgeons must use their judgment in selecting from among the different feasible treatment options.

The ASMBS cautions against the use of this position statement in litigation in which the clinical decisions of a physician are called into question. The ultimate judgment regarding the appropriateness of any specific procedure or course of action must be made by the physician in light of all the circumstances presented. Thus, an approach that differs from the position statement, standing alone, does not necessarily imply that the approach was below the standard of care. A conscientious physician may responsibly adopt a course of action different from that set forth in the position statement when, in the reasonable judgment of the physician, such a course of action is indicated by the condition of the patient, limitations on available resources, or advances in knowledge or technology. All that should be expected is that the physician will follow a reasonable course of action according to current knowledge, the available resources, and the needs of the patient to deliver effective and safe medical care. The sole purpose of the present position statement is to assist practitioners in achieving this objective.

Disclosures

The authors have no commercial associations that might be a conflict of interest in relation to this article.

References

[1] Clinical Issues. Committee of the American Society for Metabolic and Bariatric Surgery. Updated position statement on sleeve gastrectomy as a bariatric procedure. Surg Obes Relat Dis 2007;3(6):573–6.
[2] Clinical Issues. Committee of the American Society for Metabolic and Bariatric Surgery. Updated position statement on sleeve gastrectomy as a bariatric procedure. Surg Obes Relat Dis 2010;6(1):1–5.
[3] ASMBS Clinical Issues Committee. ASMBS online statements/ guidelines. Updated position statement on sleeve gastrectomy as a bariatric procedure. Surg Obes Relat Dis 2012;8(3):e21–6.
[4] Leyba JL, Aulestia SN, Llopis SN. Laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy for the treatment of morbid obesity. A prospective study of 117 patients. Obes Surg 2011;21(2):212–6.
[5] Leyba JL, Llopis SN, Aulestia SN. Laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy for the treatment of morbid obesity. A prospective study with 5 years of follow-up. Obes Surg 2014;24(12):2094–8.
[6] Peterli R, Borbely Y, Kern B, et al. Early results of the Swiss Multicentre Bypass or Sleeve Study (SM-BOSS): a prospective randomized trial comparing laparoscopic sleeve gastrectomy and Roux-en-Y gastric bypass. Ann Surg 2013;258(5):690–4.
[7] Vidal P, Ramón JM, Goday A, et al. Laparoscopic gastric bypass versus laparoscopic sleeve gastrectomy as a definitive surgical procedure for morbid obesity. Mid-term results. Obes Surg 2013;23 (3):292–9.
[8] Lakdawala MA, Bhasker A, Mulchandani D, Goel S, Jain S. Comparison between the results of laparoscopic sleeve gastrectomy and laparoscopic Roux-en-Y gastric bypass in the Indian population: a retrospective 1 year study. Obes Surg 2010;20(1):1–6.
[9] Lim DM, Taller J, Bertucci W, Riffenburgh RH, O'Leary J, Wisbach G. Comparison of laparoscopic sleeve gastrectomy to laparoscopic Roux-en-Y gastric bypass for morbid obesity in a military institution. Surg Obes Relat Dis 2014;10(2):269–76.
[10] Kehagias I, Karamanakos SN, Argentou M, Kalfarentzos F. Randomized clinical trial of laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy for the management of patients with BMI < 50 kg/m2. Obes Surg 2011;21(11):1650–6.
[11] Karamanakos SN, Vagenas K, Kalfarentzos F, Alexandrides TK. Weight loss, appetite suppression, and changes in fasting and postprandial ghrelin and peptide-YY levels after Roux-en-Y gastric bypass and sleeve gastrectomy: a prospective, double blind study. Ann Surg 2008;247(3):401–7.
[12] Zhang C, Yuan Y, Qiu C, Zhang W. A meta-analysis of 2-year effect after surgery: laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy for morbid obesity and diabetes mellitus. Obes Surg 2014;24(9):1528–35.
[13] Maciejewski ML, Arterburn DE, Van Scoyoc L, et al. Bariatric surgery and long-term durability of weight loss. JAMA Surg 2016;151(11):1046–55.
[14] Zhang Y, Zhao H, Cao Z, et al. A randomized clinical trial of laparoscopic Roux-en-Y gastric bypass and sleeve gastrectomy for the treatment of morbid obesity in China: a 5-year outcome. Obes Surg 2014;24(10):1617–24.
[15] El Chaar M, Hammoud N, Ezeji G, Claros L, Miletics M, Stoltzfus J. Laparoscopic sleeve gastrectomy versus laparoscopic Roux-en-Y gastric bypass: a single center experience with 2 years follow-up. Obes Surg 2015;25(2):254–62.
[16] Thereaux J, Corigliano N, Poitou C, Oppert JM, Czernichow S, Bouillot JL. Comparison of results after one year between sleeve gastrectomy and gastric bypass in patients with BMI $\geq$ 50 kg/m^2. Surg Obes Relat Dis 2015;11(4):785–90.
[17] Celio AC, Wu Q, Kasten KR, Manwaring ML, Pories WJ, Spaniolas K. Comparative effectiveness of Roux-en-Y gastric bypass and sleeve gastrectomy in super obese patients. Surg Endosc 2017;31(1):317–23.
[18] Jackson TD, Hutter MM. Morbidity and effectiveness of laparoscopic sleeve gastrectomy, adjustable gastric band, and gastric bypass for morbid obesity. Adv Surg 2012;46:255–68.
[19] Keidar A, Hershkop KJ, Marko L, et al. Roux-en-Y gastric bypass vs sleeve gastrectomy for obese patients with type 2 diabetes: a randomised trial. Diabetologia 2013;56(9):1914–8.
[20] Schauer PR, Bhatt DL, Kirwan JP, et al. Bariatric surgery versus intensive medical therapy for diabetes - 3-year outcomes. N Engl J Med 2014;370(21):2002–13.
[21] Boza C, Gamboa C, Salinas CJ, Achurra P, Vega A, Pérez G. Laparoscopic Roux-en-Y gastric bypass versus laparoscopic sleeve gastrectomy: a case-control study and 3 years of follow-up. Surg Obes Relat Dis 2012;8(3):243–9.
[22] Carlin AM, Zeni TM, English WJ, et al. for the Michigan Bariatric Surgery Collaborative. The comparative effectiveness of sleeve gastrectomy, gastric bypass, and adjustable gastric banding procedures for the treatment of morbid obesity. Ann Surg 2013;257 (5):791–7.
[23] Yip S, Plank LD, Murphy R. Gastric bypass and sleeve gastrectomy for type 2 diabetes: a systematic review and meta-analysis of outcomes. Obes Surg 2013;23(12):1994–2003.
[24] Li JF, Lai DD, Ni B, Sun KX. Comparison of laparoscopic Roux-en-Y gastric bypass with laparoscopic sleeve gastrectomy for morbid obesity or type 2 diabetes mellitus: a meta-analysis of randomized controlled trials. Can J Surg 2013;56(6):E158–64.
[25] Li JF, Lai DD, Lin ZH, Jiang TY, Zhang AM, Dai JF. Comparison of the long-term results of Roux-en-Y gastric bypass and sleeve gastrectomy for morbid obesity: a systematic review and meta-analysis of randomized and nonrandomized trials. Surg Laparosc Endosc Percutan Tech 2014;24(1):1–11.
[26] Lemanu DP, Singh PP, Rahman H, Hill AG, Babor R, MacCormick AD. Five-year results after laparoscopic sleeve gastrectomy: a prospective study. Surg Obes Relat Dis 2015;11(3):518–24.
[27] Abbatini F, Capoccia D, Casella G, Soricelli E, Leonetti F, Basso N. Long-term remission of type 2 diabetes in morbidly obese patients after sleeve gastrectomy. Surg Obes Relat Dis 2013;9(4):498–502.
[28] Rawlins L, Rawlins MP, Brown CC, Schumacher DL. Sleeve gastrectomy: 5-year outcomes of a single institution. Surg Obes Relat Dis 2013;9(1):21–5.
[29] Angrisani L, Santonicola A, Hasani A, Nosso G, Capaldo B, Iovino P. Five-year results of laparoscopic sleeve gastrectomy: effects on gastroesophageal reflux disease symptoms and co-morbidities. Surg Obes Relat Dis 2016;12(15):960–8.
[30] Boza C, Daroch D, Barros D, León F, Funke R, Crovari F. Long-term outcomes of laparoscopic sleeve gastrectomy as a primary bariatric procedure. Surg Obes Relat Dis 2014;10(6):1129–33.
[31] Casella G, Soricelli E, Giannotti D, et al. Long-term results after laparoscopic sleeve gastrectomy in a large monocentric series. Surg Obes Relat Dis 2016;12(4):757–62.
[32] Osland E, Yunus RM, Khan S, Alodat T, Memon B, Memon MA. Postoperative early major and minor complications in laparoscopic vertical sleeve gastrectomy (LVSG) versus laparoscopic Roux-en-Y gastric bypass (LRYGB) procedures: a meta-analysis and systematic review. Obes Surg 2016;26(10):2273–84.
[33] Fischer L, Wekerle AL, Bruckner T, et al. BariSurg trial: sleeve gastrectomy versus Roux-en-Y gastric bypass in obese patients with BMI 35-60 kg/m^2 - a multi-centre randomized patient and observer blind non-inferiority trial. BMC Surg 2015;15:87.

[34] Young MT, Gebhart A, Phelan MJ, Nguyen NT. Use and outcomes of laparoscopic sleeve gastrectomy vs laparoscopic gastric bypass: analysis of the American College of Surgeons NSQIP. J Am Coll Surg 2015;220(5):880–5.
[35] Aminian A, Brethauer SA, Sharafkhah M, Schauer PR. Development of a sleeve gastrectomy risk calculator. Surg Obes Relat Dis 2015;11(4):758–64.
[36] Spaniolas K, Trus TL, Adrales GL, Quigley MT, Pories WJ, Laycock WS. Early morbidity and mortality of laparoscopic sleeve gastrectomy and gastric bypass in the elderly: a NSQIP analysis. Surg Obes Relat Dis 2014;10(4):584–8.
[37] Goitein D, Matter I, Raziel A, et al. Portomesenteric thrombosis following laparoscopic bariatric surgery: incidence, patterns of clinical presentation, and etiology in a bariatric patient population. JAMA Surg 2013;148(4):340–6.
[38] Linden BC, Barnett SJ. Adolescent bariatric surgery. In: Agrawal S, editor. *Obesity, bariatric and metabolic surgery: a practical guide*. New York: Springer International Publishing; 2015. p. 707–12.
[39] Desai NK, Wulkan ML, Inge TH. Update on adolescent bariatric surgery. Endocrinol Metab Clin North Am 2016;45(3):667–76.
[40] Inge TH, Courcoulas AP, Jenkins TM, et al. Teen-LABS Consortium. Weight loss and health status 3 years after bariatric surgery in adolescents. N Engl J Med 2016;374(2):113–23.
[41] Himpens J, Dobbeleir J, Peeters G. Long-term results of laparoscopic sleeve gastrectomy for obesity. Ann Surg 2010;252(2):319–24.
[42] Hutter MM, Schirmer BD, Jones DB, et al. First report from the American College of Surgeons Bariatric Surgery Center Network: laparoscopic sleeve gastrectomy has morbidity and effectiveness positioned between the band and the bypass. Ann Surg 2011;254(3):410–20.
[43] Keren D, Matter I, Rainis T, Lavy A. Getting the most from the sleeve: the importance of post-operative follow-up. Obes Surg 2011;21(12):1887–93.
[44] Leivonen MK, Juuti A, Jaser N, Mustonen H. Laparoscopic sleeve gastrectomy in patients over 59 years: early recovery and 12-month follow-up. Obes Surg 2011;21(8):1180–7.
[45] Chiu S, Birch DW, Shi X, Sharma AM, Karmali S. Effect of sleeve gastrectomy on gastroesophageal reflux disease: a systematic review. Surg Obes Relat Dis 2011;7(4):510–5.
[46] Oor JE, Roks DJ, Ünlü Ç, Hazebroek EJ. Laparoscopic sleeve gastrectomy and gastroesophageal reflux disease: a systematic review and meta-analysis. Am J Surg 2016;211(1):250–67.
[47] DuPree CE, Blair K, Steele SR, Martin MJ. Laparoscopic sleeve gastrectomy in patients with preexisting gastroesophageal reflux disease : a national analysis. JAMA Surg 2014;149(4):328–34.
[48] Kehagias I, Spyropoulos C, Karamanakos S, Kalfarentzos F. Efficacy of sleeve gastrectomy as sole procedure in patients with clinically severe obesity (BMI $\leq$50 kg/m^2). Surg Obes Relat Dis 2013;9(3):363–9.
[49] van Rutte PW, Smulders JF, de Zoete JP, Nienhuijs SW. Outcome of sleeve gastrectomy as a primary bariatric procedure. Br J Surg 2014;101(6):661–8.
[50] Thereaux J, Barsamian C, Bretault M, et al. pH monitoring of gastro-oesophageal reflux before and after laparoscopic sleeve gastrectomy. Br J Surg 2016;103(4):399–406.
[51] Samakar K, McKenzie TJ, Tavakkoli A, Vernon AH, Robinson MK, Shikora SA. The effect of laparoscopic sleeve gastrectomy with concomitant hiatal hernia repair on gastroesophageal reflux disease in the morbidly obese. Obes Surg 2016;26(1):61–6.
[52] Genco A, Soricelli E, Casella G, et al. Gastroesophageal reflux disease and Barrett's esophagus after laparoscopic sleeve gastrectomy; a possible, underestimated long-term complication. Surg Obes Relat Dis 2017;13(4):568–74.
[53] Barr AC, Frelich MJ, Bosler ME, Goldblatt MI, Gould JC. GERD and acid reduction medication use following gastric bypass and sleeve gastrectomy. Surg Endosc 2017;31(1):410–5.
[54] Gagner M. Is sleeve gastrectomy always an absolute contraindication in patients with Barrett's? Obes Surg 2016;26(4):715–7.