

Cover page

TITLE:

THE NEW ONSET OF GERD AFTER SLEEVE
GASTRECTOMY: A SYSTEMATIC REVIEW

RUNNING HEADS:

Gastroesophageal reflux disease after bariatric
surgery

NCT Number: not available

Date of document: 14/12/2021

ABSTRACT:

BACKGROUND: The main adverse effect is gastroesophageal reflux disease (GERD), with concern on the development of Barrett's esophagus and esophageal adenocarcinoma in the long term. However, the relationship between SG and GERD is complex. The aim of this study is to systematically evaluate all published data existing in the literature to evaluate the effect of sleeve gastrectomy on GERD, esophagitis, BE in order to clarify the long-term clinical sequelae of this procedure.

MATERIALS AND METHODS: This systematic review was conducted in accordance with the guidelines for Preferred Reporting Items for Systematic Review and Meta-analyzes (PRISMA).

Published studies that contained outcome data for primary sleeve gastrectomy associated with the primary and secondary outcomes listed below were included.

RESULTS: 49 articles were eligible for inclusion that met the following criteria: publications dealing with patients undergoing laparoscopic SG, publications describing pre- and postoperative GERD symptoms and/or esophageal function tests, articles in English, human studies and text complete available.

CONCLUSIONS: We have controversial data on LSG and GERD in the literature as there is a multifactorial relationship between LSG and GERD.

The most recent studies have shown satisfactory control of postoperative reflux in most patients and low rates of de novo GERD.

These data are leading to wider acceptance of LSG as a bariatric procedure even in obese patients with GERD.

Key words: Sleeve Gastrectomy, Bariatric Surgery, Obesity, Gastrectomy, Gastric Sleeve, Stomach Staple, Gastroesophageal Reflux, Gastroesophageal reflux, Reflux, Metaplasia, Barrett's esophagus, Barrett's esophagus

INTRODUCTION

Obesity is classified as one of the most severe global public health problems. Over 2.1 billion adults worldwide are considered overweight or obese; 640 million of these are classified as obese. Sleeve gastrectomy (SG) has become the most common procedure performed in the world since 2014 [1] because it is well defined, it is easier to perform than other types of bariatric surgery, the learning curve is shorter, the morbidity and mortality rates are low, and it leads to effective weight loss [2]. Obese patients develop obesity-related comorbidities including type 2 diabetes mellitus (T2DM), hypertension, dyslipidemia, coronary artery disease, certain types of cancer, and gastroesophageal reflux disease (GERD) [3–7]. The main adverse effect is gastroesophageal reflux disease (GERD), with concern on the development of Barrett's esophagus and esophageal adenocarcinoma in the long term. However, the relationship between SG and GERD is complex [8–12]. Different mechanisms involved: disruption of the angle of His, partial sectioning of sling fibers of the lower esophageal sphincter (LES), reduced gastric compliance due to gastric fundus removal, occurrence of hiatal hernia (HH), or reduced antral function. In contrast, other studies have reported a decreased prevalence of GERD after SG [13–15] explained by several mechanisms including weight loss, decreased acid production and accelerated gastric emptying. The measured increase in GERD prevalence ranged from 2.1% to 34.9% in the analyzed literature. There was marked heterogeneity between the studies in regard to a number of factors including preoperative BMI, method of evaluating GERD, exclusion criteria, length of follow-up, and operative technique [16–18].

The aim of this study is to systematically evaluate all published data existing in the literature to evaluate the effect of sleeve gastrectomy on GERD, esophagitis, BE in order to clarify the long-term clinical sequelae of this procedure.

MATERIALS AND METHODS

This systematic review was conducted in accordance with the guidelines for Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA).

A systematic search was performed using electronic searches in EMBASE, Medline, Cochrane Library, and Psycinfo. Free text search in all fields was performed for "Sleeve Gastrectomy", "Bariatric Surgery", "Obesity", "Gastrectomy", "Gastric Sleeve", "Stomach Staple", "Gastroesophageal Reflux", "Gastro - Esophageal reflux", "Reflux", "Metaplasia", "Barrett's esophagus" and "Barrett's esophagus". The search included all study designs, with additional non-research captured studies identified through bibliographic cross-references.

Published studies that contained outcome data for primary sleeve gastrectomy associated with the primary and secondary outcomes listed below were included.

RESULTS

49 articles were eligible for inclusion that met the following criteria: publications dealing with patients undergoing laparoscopic SG, publications describing pre- and postoperative GERD symptoms and/or esophageal function tests, articles in English, human studies and text complete available. The following exclusion criteria were used for study selection: abstracts, case series, articles describing laparoscopic SG after previous fundoplication, laparoscopic SG with concomitant antireflux procedures, laparoscopic SG after previous bariatric surgical procedures, open SG and no-english articles (Table 1) [19-67].

DISCUSSION

Obesity is one of the risk factors for GERD, which has resulted in a significant increase in the incidence of GERD worldwide [68].

Obesity has been reported to increase the incidence of GERD with an OR of 1.73 and Barrett's esophagus with an OR of 1.24; esophageal adenocarcinoma is the most

serious complication of GERD (OR, 2.45) [69-70].

Numerous studies have been performed in the literature with controversial results on the onset of GERD after LSG.

Albanopoulos et al., Alexandrou et al. and Althuwaini et al. [20-21] showed that LSG seemed to precipitate GERD symptoms, dissection near the angle of His, and drastic reduction in gastric capacity increased the chance that patients would maintain or develop new GERD symptoms.

The studies by Arman et al., Borbely et al. and Braghetto et al. [24,28,30] found that LSG is associated with a significantly higher likelihood that acid-lowering medications are needed to control GERD symptoms 12 months after LSG compared with gastric bypass. LSG leads to a considerable rate of postoperative GERD. De novo GERD consist of approximately half of preoperative silent GERD and completely de novo GERD. Most patients with preoperative silent GERD have become symptomatic after LSG. Barrett's esophagus could be a late complication after SG and bariatric surgeons should be aware of the important association between GERD and obesity.

Burgerhart et al [32] confirm that it seems likely that the increase in acid exposure after LSG is due to the modified anatomy, which leads to a decrease in the resting pressure of Les. The study results support the idea that in patients with significant preoperative symptoms of GERD, gastric bypass surgery may be more appropriate than LSG.

Del Genio et al and DuPree et al. [40-41] claim that LSG is an effective restrictive procedure that creates delayed esophageal emptying without compromising the function of the LES. Retrograde movements and increased acid exposure are likely due to postprandial stasis and regurgitation. LSG did not reliably relieve or improve GERD symptoms and induced GERD in some previously asymptomatic patients
Indeed, Flolo et al [44] confirmed that the incidence of GERD more than doubled

from baseline at 2 years and further increased at a rate of 35% at 5 years.

De novo gastroesophageal reflux symptoms appear between the third and sixth postoperative year. this unfavorable evolution may have been prevented in some patients by continuous follow-up outpatient visits beyond the third year.

The new onset of postoperative GERD is an unfortunate side effect of LSG, and more studies reflecting the aggressive closure of healing defects are needed to determine if this provides a long-term solution to this problem.

LSG can increase the prevalence of GERD despite satisfactory weight loss.

In the study by Menenakos et al. [58] about 25% of patients developed or worsened their GERD symptoms, all responsive to PPI treatment (65 out of 261 patients). Heartburn was significantly relieved after the postoperative first trimester. Symptoms of GERD are especially common in the first few months. Gastroesophageal reflux is the main complication. Proton pump inhibitor treatment is mostly effective in controlling patients' symptoms. Endoscopic surveillance is desirable in the long term for these patients.

Rebecchi et al and Sharma et al. [63-64] concluded that in obese patients with GERD, LSG improves symptoms and controls reflux in most cases, whereas in patients with no preoperative evidence of GERD, de novo reflux is rare. Therefore, LSG should be considered an effective option for the surgical treatment of obese patients with GERD. The presence of GERD cannot be considered a contraindication to sleeve gastrectomy. There is improvement in Gerd as assessed by the symptom questionnaires. The new onset of GERD detected on scintigraphy may not be pathological as there is a decrease in total acid production after surgery; however, it still remains an important issue and needs long-term follow-up [72-74].

CONCLUSIONS

We have controversial data on LSG and GERD in the literature as there is a multifactorial relationship between LSG and GERD. The most recent studies have

shown satisfactory control of postoperative reflux in most patients and low rates of de novo GERD. Compared to LSG, obese patients receiving LRYGB had a lower risk of new onset or worsening of GERD. Some patients have been converted to LRYGB treatment due to severe reflux after LSG. Therefore, we recommend LRYGB as the preferred treatment for obese patients with GERD.

These data are leading to wider acceptance of LSG as a bariatric procedure even in obese patients with GERD, provided a tubular cuff is created, as recently stated in the 5th International Consensus Conference on sleeve gastrectomy [71].

In conclusion, bariatric surgery has become safer as surgeons gain experience in evaluating and treating obese patients, but careful medical evaluation is mandatory before choosing the type of bariatric surgery, especially for those patients who already have GERD.

REFERENCES

1. Angrisani L, Santonicola A, Iovino P, et al. Bariatric surgery and endoluminal procedures: IFSO Worldwide Survey 2014. *Obes Surg.* 2017. <https://doi.org/10.1007/s11695-017-2666-x>.
2. Carlin AM, Zeni TM, English WJ, et al.; 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: 791-7.
3. T. L. S. Visscher and J. C. Seidell, "The public health impact of obesity," *Annual Review of Public Health*, vol. 22, pp. 355–375, 2001.
4. F. X. Pi-Sunyer, "Medical hazards of obesity," *Annals of Internal Medicine*, vol. 119, no. 7, pp. 655–660, 1993.
5. A. Must, J. Spadano, E. H. Coakley, A. E. Field, G. Colditz, and W. H. Dietz, "The disease burden associated with overweight and obesity," *Journal of the American Medical Association*, vol. 282, no. 16, pp. 1523–1529, 1999.
6. A. E. Field, E. H. Coakley, A. Must et al., "Impact of overweight on the risk of developing common chronic diseases during a 10- year period," *Archives of Internal Medicine*, vol. 161, no. 13, pp. 1581–1586, 2001.
7. A. Lukanova, O. Björ, R. Kaaks et al., "Body mass index and cancer: results from the Northern Sweden Health and Disease Cohort," *International Journal of Cancer*, vol. 118, no. 2, pp. 458– 466, 2006.
8. 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;13:568–74.

9. Felsenreich DM, Kefurt R, Schermann M, et al. Reflux, sleeve dilation, and Barrett's esophagus after laparoscopic sleeve gastrectomy: long-term follow-up. *Obes Surg*. 2017. <https://doi.org/10.1007/s11695-017-2748-9>.
10. Stenard F, Iannelli A. Laparoscopic sleeve gastrectomy and gastroesophageal reflux. *World J Gastroenterol*. 2015;21(36):10348–57.
11. Khan A, Kim A, Sanossian C, et al. Impact of obesity treatment on gastroesophageal reflux disease. *World J Gastroenterol*. 2016;22: 1627–38.
12. Mion F, Dargent J. Gastro-oesophageal reflux disease and obesity: pathogenesis and response to treatment. *Best Pract Res Clin Gastroenterol*. 2014;28:611–22.
13. Chopra A, Chao E, Etkin Y, et al. Laparoscopic sleeve gastrectomy for obesity: can it be considered a definitive procedure? *Surg Endosc*. 2012;26:831–7.
14. Pallati PK, Shaligram A, Shostrom VK, et al. Improvement in gastroesophageal reflux disease symptoms after various bariatric procedures: review of the Bariatric Outcomes Longitudinal Database. *Surg Obes Relat Dis*. 2014;10:502–7.
15. Sucandy I, Chrestiana D, Bonanni F, et al. Gastroesophageal reflux symptoms after laparoscopic sleeve gastrectomy for morbid obesity. The importance of preoperative evaluation and selection. *N Am J Med Sci*. 2015;7:189–93
16. Tartaglia N, Iadarola R, Di Lascia A, Cianci P, Fersini A, Ambrosi A. What is the treatment of tracheal lesions associated with traditional thyroidectomy? Case report and systematic review. *World J Emerg Surg*. 2018 Mar 23;13:15. doi: 10.1186/s13017-018-0175-4. PMID: 29588652; PMCID: PMC5865337.
17. Cianci P, Tartaglia N, Altamura A, Di Lascia A, Fersini A, Neri V, Ambrosi A. Cervical Esophagotomy for Foreign Body Extraction: A Case Report and Extensive Literature Review of the Last 20 Years. *Am J Case Rep*. 2018 Apr 5;19:400-405. doi: 10.12659/ajcr.908373. PMID: 29618719; PMCID: PMC5900799.

18. Anania G, Agresta F, Artioli E, Rubino S, Resta G, Vettoretto N, Petz WL, Bergamini C, Arezzo A, Valpiani G, Morotti C, Silecchia G; SICE CoDIG (Colon Dx Italian Group). Laparoscopic right hemicolectomy: the SICE (Società Italiana di Chirurgia Endoscopica e Nuove Tecnologie) network prospective trial on 1225 cases comparing intra corporeal versus extra corporeal ileo-colic side-to-side anastomosis. *Surg Endosc.* 2020 Nov;34(11):4788-4800. doi: 10.1007/s00464-019-07255-2. Epub 2019 Nov 18. Erratum in: *Surg Endosc.* 2019 Dec 12;; PMID: 31741153; PMCID: PMC7572335.
19. Abd Ellatif ME, Abdallah E, Askar W, Thabet W, Aboushady M, Abbas AE, El Hadidi A, Elezaby AF, Salama AF, Dawoud IE, Moatamed A, Wahby M. Long term predictors of success after laparoscopic sleeve gastrectomy. *Int J Surg.* 2014;12(5):504-8. doi: 10.1016/j.ijisu.2014.02.008. Epub 2014 Feb 18. PMID: 24560848.
20. Albanopoulos K, Tsamis D, Natoudi M, Alevizos L, Zografos G, Leandros E. The impact of laparoscopic sleeve gastrectomy on weight loss and obesity-associated comorbidities: the results of 3 years of follow-up. *Surg Endosc.* 2016 Feb;30(2):699-705. doi: 10.1007/s00464-015-4262-2. Epub 2015 Jun 20. PMID: 26091999.
21. Alexandrou A, Athanasiou A, Michalinos A, Felekouras E, Tsigris C, Diamantis T. Laparoscopic sleeve gastrectomy for morbid obesity: 5-year results. *Am J Surg.* 2015 Feb;209(2):230-4. doi: 10.1016/j.amjsurg.2014.04.006. Epub 2014 Jun 20. PMID: 25034410.
22. Althuwaini S, Bamehriz F, Aldohayan A, Alshammari W, Alhaidar S, Alotaibi M, Alanazi A, Alsaahbi H, Almadi MA. Prevalence and Predictors of Gastroesophageal Reflux Disease After Laparoscopic Sleeve Gastrectomy. *Obes Surg.* 2018 Apr;28(4):916-922. doi: 10.1007/s11695-017-2971-4. PMID: 29043549.

23. 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 Jun;12(5):960-968. doi: 10.1016/j.soard.2015.09.014. Epub 2015 Sep 26. PMID: 26775051.
24. Arman GA, Himpens J, Dhaenens J, Ballet T, Vilallonga R, Leman G. Long-term (11+years) outcomes in weight, patient satisfaction, comorbidities, and gastroesophageal reflux treatment after laparoscopic sleeve gastrectomy. *Surg Obes Relat Dis*. 2016 Dec;12(10):1778-1786. doi: 10.1016/j.soard.2016.01.013. Epub 2016 Jan 19. PMID: 27178613.
25. 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 Jan;31(1):410-415. doi: 10.1007/s00464-016-4989-4. Epub 2016 Jun 10. PMID: 27287901.
26. Barry RG, Amiri FA, Gress TW, Nease DB, Canterbury TD. Laparoscopic vertical sleeve gastrectomy: A 5-year veterans affairs review. *Medicine (Baltimore)*. 2017 Sep;96(35):e7508. doi: 10.1097/MD.0000000000007508. PMID: 28858079; PMCID: PMC5585473.
27. Berry MA, Urrutia L, Lamoza P, Molina A, Luna E, Parra F, Domínguez MJ, Alonso R. Sleeve Gastrectomy Outcomes in Patients with BMI Between 30 and 35-3 Years of Follow-Up. *Obes Surg*. 2018 Mar;28(3):649-655. doi: 10.1007/s11695-017-2897-x. PMID: 28975492; PMCID: PMC5803286.
28. Borbély Y, Schaffner E, Zimmermann L, Huguenin M, Plitzko G, Nett P, Kröll D. De novo gastroesophageal reflux disease after sleeve gastrectomy: role of preoperative silent reflux. *Surg Endosc*. 2019 Mar;33(3):789-793. doi: 10.1007/s00464-018-6344-4. Epub 2018 Jul 12. PMID: 30003346.
29. 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 Nov-Dec;10(6):1129-33. doi: 10.1016/j.soard.2014.03.024. Epub 2014 Apr 14. PMID: 25500284.
30. Braghetto I, Csendes A. Prevalence of Barrett's Esophagus in Bariatric Patients Undergoing Sleeve Gastrectomy. *Obes Surg*. 2016 Apr;26(4):710-4. doi: 10.1007/s11695-015-1574-1. PMID: 25855575.
31. Braghetto I, Korn O. Late esophagogastric anatomic and functional changes after sleeve gastrectomy and its clinical consequences with regards to gastroesophageal reflux disease. *Dis Esophagus*. 2019 Jun 1;32(6):doz020. doi: 10.1093/dote/doz020. PMID: 31076757.
32. Burgerhart JS, Schotborgh CA, Schoon EJ, Smulders JF, van de Meeberg PC, Siersema PD, Smout AJ. Effect of sleeve gastrectomy on gastroesophageal reflux. *Obes Surg*. 2014 Sep;24(9):1436-41. doi: 10.1007/s11695-014-1222-1. PMID: 24619293.
33. Carabotti M, Silecchia G, Greco F, Leonetti F, Piretta L, Rengo M, Rizzello M, Osborn J, Corazziari E, Severi C. Impact of laparoscopic sleeve gastrectomy on upper gastrointestinal symptoms. *Obes Surg*. 2013 Oct;23(10):1551-7. doi: 10.1007/s11695-013-0973-4. PMID: 23636996.
34. Carter PR, LeBlanc KA, Hausmann MG, Kleinpeter KP, deBarros SN, Jones SM. Association between gastroesophageal reflux disease and laparoscopic sleeve gastrectomy. *Surg Obes Relat Dis*. 2011 Sep-Oct;7(5):569-72. doi: 10.1016/j.soard.2011.01.040. Epub 2011 Mar 22. PMID: 21429818.
35. Castagneto Gisse L, Casella Mariolo JR, Genco A, Troisi A, Basso N, Casella G. 10-year follow-up after laparoscopic sleeve gastrectomy: Outcomes in a monocentric series. *Surg Obes Relat Dis*. 2018 Oct;14(10):1480-1487. doi: 10.1016/j.soard.2018.06.021. Epub 2018 Jul 2. PMID: 30093311.
36. Catheline JM, Fysekidis M, Bachner I, Bihan H, Kassem A, Dbouk R, Bdeoui N, Boschetto A, Cohen R. Five-year results of sleeve gastrectomy. *J Visc Surg*.

- 2013 Nov;150(5):307-12. doi: 10.1016/j.jviscsurg.2013.08.008. Epub 2013 Sep 21. PMID: 24060743.
37. Chuffart E, Sodji M, Dalmay F, Iannelli A, Mathonnet M. Long-Term Results After Sleeve Gastrectomy for Gastroesophageal Reflux Disease: a Single-Center French Study. *Obes Surg.* 2017 Nov;27(11):2890-2897. doi: 10.1007/s11695-017-2698-2. PMID: 28474318.
38. Coupaye M, Gorbatchef C, Calabrese D, Sami O, Msika S, Coffin B, Ledoux S. Gastroesophageal Reflux After Sleeve Gastrectomy: a Prospective Mechanistic Study. *Obes Surg.* 2018 Mar;28(3):838-845. doi: 10.1007/s11695-017-2942-9. PMID: 28993985.
39. Dakour Aridi H, Asali M, Fouani T, Alami RS, Safadi BY. Gastroesophageal Reflux Disease After Laparoscopic Sleeve Gastrectomy with Concomitant Hiatal Hernia Repair: an Unresolved Question. *Obes Surg.* 2017 Nov;27(11):2898-2904. doi: 10.1007/s11695-017-2702-x. PMID: 28455802.
40. Del Genio G, Tolone S, Limongelli P, Bruscianno L, D'Alessandro A, Docimo G, Rossetti G, Silecchia G, Iannelli A, del Genio A, del Genio F, Docimo L. Sleeve gastrectomy and development of "de novo" gastroesophageal reflux. *Obes Surg.* 2014 Jan;24(1):71-7. doi: 10.1007/s11695-013-1046-4. PMID: 24249251.
41. DuPree CE, Blair K, Steele SR, Martin MJ. Laparoscopic sleeve gastrectomy in patients with preexisting gastroesophageal reflux disease : a national analysis. *JAMA Surg.* 2014 Apr;149(4):328-34. doi: 10.1001/jamasurg.2013.4323. PMID: 24500799.
42. Felsenreich DM, Ladinig LM, Beckerhinn P, Sperker C, Schwameis K, Krebs M, Jedamzik J, Eilenberg M, Bichler C, Prager G, Langer FB. Update: 10 Years of Sleeve Gastrectomy-the First 103 Patients. *Obes Surg.* 2018 Nov;28(11):3586-3594. doi: 10.1007/s11695-018-3399-1. PMID: 30047101.
43. Felsenreich DM, Kefurt R, Schermann M, Beckerhinn P, Kristo I, Krebs M, Prager G, Langer FB. Reflux, Sleeve Dilation, and Barrett's Esophagus after

- Laparoscopic Sleeve Gastrectomy: Long-Term Follow-Up. *Obes Surg.* 2017 Dec;27(12):3092-3101. doi: 10.1007/s11695-017-2748-9. PMID: 28593484.
44. Flølo TN, Andersen JR, Kolotkin RL, Aasprang A, Natvig GK, Hufthammer KO, Våge V. Five-Year Outcomes After Vertical Sleeve Gastrectomy for Severe Obesity: A Prospective Cohort Study. *Obes Surg.* 2017 Aug;27(8):1944-1951. doi: 10.1007/s11695-017-2605-x. PMID: 28224471.
45. Gadiot RP, Biter LU, van Mil S, Zengerink HF, Apers J, Mannaerts GH. Long-Term Results of Laparoscopic Sleeve Gastrectomy for Morbid Obesity: 5 to 8-Year Results. *Obes Surg.* 2017 Jan;27(1):59-63. doi: 10.1007/s11695-016-2235-8. PMID: 27178407.
46. Garg H, Aggarwal S, Misra MC, Priyadarshini P, Swami A, Kashyap L, Jaiswal R. Mid to long term outcomes of Laparoscopic Sleeve Gastrectomy in Indian population: 3-7 year results - A retrospective cohort study. *Int J Surg.* 2017 Dec;48:201-209. doi: 10.1016/j.ijssu.2017.10.076. Epub 2017 Nov 6. PMID: 29122706.
47. Gemici E, Kones O, Seyit H, Surek A, Cikot M, Bozkurt MA, Alis H. Outcomes of laparoscopic sleeve gastrectomy by means of esophageal manometry and pH-metry, before and after surgery. *Wideochir Inne Tech Maloinwazyjne.* 2020 Mar;15(1):129-135. doi: 10.5114/wiitm.2019.83198. Epub 2019 Feb 25. PMID: 32117496; PMCID: PMC7020704.
48. Genco A, Soricelli E, Casella G, Maselli R, Castagneto-Gissey L, Di Lorenzo N, Basso N. Gastroesophageal reflux disease and Barrett's esophagus after laparoscopic sleeve gastrectomy: a possible, underestimated long-term complication. *Surg Obes Relat Dis.* 2017 Apr;13(4):568-574. doi: 10.1016/j.soard.2016.11.029. Epub 2016 Dec 9. PMID: 28089434.
49. Georgia D, Stamatina T, Maria N, Konstantinos A, Konstantinos F, Emmanouil L, Georgios Z, Dimitrios T. 24-h Multichannel Intraluminal Impedance PH-metry 1 Year After Laparoscopic Sleeve Gastrectomy: an Objective Assessment of

- Gastroesophageal Reflux Disease. *Obes Surg.* 2017 Mar;27(3):749-753. doi: 10.1007/s11695-016-2359-x. PMID: 27592124.
50. Hendricks L, Alvarenga E, Dhanabalsamy N, Lo Menzo E, Szomstein S, Rosenthal R. Impact of sleeve gastrectomy on gastroesophageal reflux disease in a morbidly obese population undergoing bariatric surgery. *Surg Obes Relat Dis.* 2016 Mar-Apr;12(3):511-517. doi: 10.1016/j.soard.2015.08.507. Epub 2015 Oct 1. PMID: 26792456.
51. Himpens J, Dobbeleir J, Peeters G. Long-term results of laparoscopic sleeve gastrectomy for obesity. *Ann Surg.* 2010 Aug;252(2):319-24. doi: 10.1097/SLA.0b013e3181e90b31. PMID: 20622654.
52. Hirth DA, Jones EL, Rothchild KB, Mitchell BC, Schoen JA. Laparoscopic sleeve gastrectomy: long-term weight loss outcomes. *Surg Obes Relat Dis.* 2015 Sep-Oct;11(5):1004-7. doi: 10.1016/j.soard.2015.02.016. Epub 2015 Feb 24. PMID: 25980329.
53. Howard DD, Caban AM, Cendan JC, Ben-David K. Gastroesophageal reflux after sleeve gastrectomy in morbidly obese patients. *Surg Obes Relat Dis.* 2011 Nov-Dec;7(6):709-13. doi: 10.1016/j.soard.2011.08.003. Epub 2011 Aug 16. PMID: 21955743.
54. Kehagias I, Spyropoulos C, Karamanakos S, Kalfarentzos F. Efficacy of sleeve gastrectomy as sole procedure in patients with clinically severe obesity (BMI ≤ 50 kg/m²). *Surg Obes Relat Dis.* 2013 May-Jun;9(3):363-9. doi: 10.1016/j.soard.2011.12.011. Epub 2012 Jan 13. PMID: 22342326.
55. Kowalewski PK, Olszewski R, Walędziak MS, Janik MR, Kwiatkowski A, Gałązka-Świderek N, Cichoń K, Brągoszewski J, Paśnik K. Long-Term Outcomes of Laparoscopic Sleeve Gastrectomy-a Single-Center, Retrospective Study. *Obes Surg.* 2018 Jan;28(1):130-134. doi: 10.1007/s11695-017-2795-2. PMID: 28707172; PMCID: PMC5735208.

56. Lemaître F, Léger P, Nedelcu M, Nocca D. Laparoscopic sleeve gastrectomy in the South Pacific. Retrospective evaluation of 510 patients in a single institution. *Int J Surg.* 2016 Jun;30:1-6. doi: 10.1016/j.ijisu.2016.04.002. Epub 2016 Apr 8. PMID: 27063637.
57. Lim CH, Lee PC, Lim E, Tan J, Chan WH, Tan HC, Ganguly S, Tham KW, Eng A. Correlation Between Symptomatic Gastro-Esophageal Reflux Disease (GERD) and Erosive Esophagitis (EE) Post-vertical Sleeve Gastrectomy (VSG). *Obes Surg.* 2019 Jan;29(1):207-214. doi: 10.1007/s11695-018-3509-0. PMID: 30238218.
58. Menenakos E, Stamou KM, Albanopoulos K, Papailiou J, Theodorou D, Leandros E. Laparoscopic sleeve gastrectomy performed with intent to treat morbid obesity: a prospective single-center study of 261 patients with a median follow-up of 1 year. *Obes Surg.* 2010 Mar;20(3):276-82. doi: 10.1007/s11695-009-9918-3. Epub 2009 Jul 28. PMID: 19636644.
59. Nocca D, Loureiro M, Skalli EM, Nedelcu M, Jausse A, Deloze M, Lefebvre P, Fabre JM. Five-year results of laparoscopic sleeve gastrectomy for the treatment of severe obesity. *Surg Endosc.* 2017 Aug;31(8):3251-3257. doi: 10.1007/s00464-016-5355-2. Epub 2016 Dec 23. PMID: 28008465.
60. Pilone V, Tramontano S, Renzulli M, Zulli C, Schiavo L. Gastroesophageal Reflux After Sleeve Gastrectomy: New Onset and Effect on Symptoms on a Prospective Evaluation. *Obes Surg.* 2019 Nov;29(11):3638-3645. doi: 10.1007/s11695-019-04046-5. PMID: 31267475.
61. Pok EH, Lee WJ, Ser KH, Chen JC, Chen SC, Tsou JJ, Chin KF. Laparoscopic sleeve gastrectomy in Asia: Long term outcome and revisional surgery. *Asian J Surg.* 2016 Jan;39(1):21-8. doi: 10.1016/j.asjsur.2015.03.006. Epub 2015 May 8. PMID: 25964106.

62. Rawlins L, Rawlins MP, Brown CC, Schumacher DL. Sleeve gastrectomy: 5-year outcomes of a single institution. *Surg Obes Relat Dis*. 2013 Jan-Feb;9(1):21-5. doi: 10.1016/j.soard.2012.08.014. Epub 2012 Sep 6. PMID: 23201209.
63. Rebecchi F, Allaix ME, Giaccone C, Ugliono E, Scozzari G, Morino M. Gastroesophageal reflux disease and laparoscopic sleeve gastrectomy: a physiopathologic evaluation. *Ann Surg*. 2014 Nov;260(5):909-14; discussion 914-5. doi: 10.1097/SLA.0000000000000967. PMID: 25379861.
64. Sharma A, Aggarwal S, Ahuja V, Bal C. Evaluation of gastroesophageal reflux before and after sleeve gastrectomy using symptom scoring, scintigraphy, and endoscopy. *Surg Obes Relat Dis*. 2014 Jul-Aug;10(4):600-5. doi: 10.1016/j.soard.2014.01.017. Epub 2014 Jan 28. PMID: 24837563.
65. Sheppard CE, Sadowski DC, de Gara CJ, Karmali S, Birch DW. Rates of reflux before and after laparoscopic sleeve gastrectomy for severe obesity. *Obes Surg*. 2015 May;25(5):763-8. doi: 10.1007/s11695-014-1480-y. PMID: 25411120.
66. Soricelli E, Casella G, Baglio G, Maselli R, Ernesti I, Genco A. Lack of correlation between gastroesophageal reflux disease symptoms and esophageal lesions after sleeve gastrectomy. *Surg Obes Relat Dis*. 2018 Jun;14(6):751-756. doi: 10.1016/j.soard.2018.02.008. Epub 2018 Feb 13. PMID: 29571635.
67. Viscido G, Gorodner V, Signorini F, Navarro L, Obeide L, Moser F. Laparoscopic Sleeve Gastrectomy: Endoscopic Findings and Gastroesophageal Reflux Symptoms at 18-Month Follow-Up. *J Laparoendosc Adv Surg Tech A*. 2018 Jan;28(1):71-77. doi: 10.1089/lap.2017.0398. Epub 2017 Dec 11. PMID: 29227187.
68. Richter JE, Rubenstein JH. Presentation and epidemiology of gastroesophageal reflux disease. *Gastroenterology*. 2018;154:267–76.

69. Eusebi LH, Ratnakumaran R, Yuan Y, et al. Global prevalence of, and risk factors for, gastro-oesophageal reflux symptoms: a meta-analysis. *Gut*. 2018;67:430–40.
70. Singh S, Sharma AN, Murad MH, et al. Central adiposity is associated with increased risk of esophageal inflammation, metaplasia, and adenocarcinoma: a systematic review and meta-analysis. *Clin Gastroenterol Hepatol*. 2013;11:1399–1412.e1397.
71. Gagner M, Hutchinson C, Rosenthal R. Fifth International Consensus Conference: current status of sleeve gastrectomy. *Surg Obes Relat Dis* 2016; **12**: 750-756 [PMID: 27178618 DOI: 10.1016/j.soard.2016.01.022]
72. Tartaglia N, Di Lascia A, Vovola F, Cianci P, Fersini A, Pacilli M, Pavone G, Ambrosi A. Bilateral central neck dissection in the treatment of early unifocal papillary thyroid carcinomas with poor risk factors A mono-institutional experience. *Ann Ital Chir*. 2020;91:161-165. PMID: 32149727.
73. Pacilli M, Tartaglia N, Gerundo A, Pavone G, Fersini A, Ambrosi A. Energy Based Vessel Sealing Devices in Thyroid Surgery: A Systematic Review to Clarify the Relationship with Recurrent Laryngeal Nerve Injuries. *Medicina (Kaunas)*. 2020 Nov 27;56(12):651. doi: 10.3390/medicina56120651. PMID: 33260912; PMCID: PMC7760641.
74. Tartaglia N, Pavone G, Lizzi V, Vovola F, Tricarico F, Pacilli M, Ambrosi A. How emergency surgery has changed during the COVID-19 pandemic: A cohort study. *Ann Med Surg (Lond)*. 2020 Dec 5;60:686-689. doi: 10.1016/j.amsu.2020.12.001. PMID: 33312562; PMCID: PMC7719013.

Not commissioned, externally peer-reviewed