The American Journal of Surgery (2016) 211, 250-267

The American Journal of Surgery®

Review

Laparoscopic sleeve gastrectomy and gastroesophageal reflux disease: a systematic review and meta-analysis

Jelmer E. Oor, M.D.[a,*], David J. Roks, M.D.[b], Çagdas Ünlü, M.D., Ph.D.[a], Eric J. Hazebroek, M.D., Ph.D.[a]

[a]Department of Surgery, St. Antonius Hospital, Koekoekslaan 1, 3430 VB Nieuwegein, The Netherlands;
[b]Department of Surgery, Meander Medical Center, Maatweg 3, Amersfoort, The Netherlands

KEYWORDS:
Gastroesophageal reflux disease;
Laparoscopic gastric sleeve;
Sleeve gastrectomy

Abstract

BACKGROUND: The effect of sleeve gastrectomy (SG) on the prevalence of gastroesophageal reflux disease (GERD) remains unclear. We aimed to outline the currently available literature.

DATA SOURCES: All relevant databases were searched for publications examining the effect of laparoscopic SG on GERD. Primary outcome measure was change in prevalence of GERD symptoms, antireflux medication use, and esophageal function tests. Secondary outcomes were prevalence of new-onset GERD and esophagitis. Thirty-three articles were included. Eleven studies used questionnaires to assess changes in the prevalence of GERD symptoms, with a risk difference in prevalence of 4.3%. Eight studies used esophageal function tests, with paradoxical results. Pooled incidence of new-onset GERD symptoms was 20%, with a strong suggestion of heterogeneity. New-onset esophagitis ranged from 6.3% to 63.3%.

CONCLUSIONS: Because of high heterogeneity among available studies and paradoxical outcomes of objective esophageal function tests, the exact effect of laparoscopic SG on the prevalence of GERD remains unanswered. Surgeons should carefully evaluate preoperative GERD symptoms when choosing the proper bariatric technique.

Gastroesophageal reflux disease (GERD) has been shown to have a significant impact on the quality of life of patients suffering from this chronic disease of the upper digestive tract.[1] GERD is a frequently encountered problem in Western populations, with a reported prevalence of 10% to 20 % in the general population and an increase in prevalence of 4% each year for the past 2 decades.[2,3] Obese patients show a significant higher prevalence of GERD, ranging from 37% to 72%, thereby making GERD a potential public health problem.[4,5] Through a cross-sectional study using questionnaires and endoscopy, El-Serag et al[6] concluded that increased body mass index (BMI) increases the risk of GERD symptoms and erosive esophagitis (EE), independent of demographic features and dietary intake. Edelstein et al showed central adiposity to be associated with the development of Barrett's esophagus and a subsequent increased odds ratio was found for the development of esophageal adenocarcinoma in obese individuals.[7,8] The possible pathological mechanisms involved in the

There were no relevant financial relationships or any sources of support in the form of grants, equipment, or drugs.
The authors declare no conflicts of interest.
* Corresponding author. Tel.: +31-883201925; fax: +31-306036578.
E-mail address: j.oor@antoniusziekenhuis.nl
Manuscript received April 30, 2015; revised manuscript May 17, 2015

0002-9610/$ - see front matter © 2016 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.amjsurg.2015.05.031

higher prevalence of GERD in this group of patients includes increased intra-abdominal pressure causing disruption of the esophagogastric junction, a hypotensive lower esophageal sphincter (LES), an increase in intragastric pressure, and esophageal motor disorders.[9–13]

Several studies showed good results after laparoscopic Roux-en-Y gastric bypass (LRYGB) procedures on GERD symptoms in (morbidly) obese patients and conclude that it is a safe procedure for inducing weight loss in morbidly obese adolescents as well as treating the concomitant gastrointestinal comorbidities, including GERD.[14–18]

Sleeve gastrectomy (SG) was first introduced in 1988 by Hess as part of the biliopancreatic diversion duodenal switch procedure. In 1999, it was first performed laparoscopically and has gradually become a standalone bariatric procedure.[19,20] Laparoscopic SG is a bariatric procedure that is fast gaining popularity worldwide for treating (morbidly) obese patients because of being a relatively technically simple and fast procedure compared with LRYGB. SG acts in a different way compared with LRYGB, because it uses restriction of the stomach size to induce satiety and decreases appetite through resection of ghrelin-producing cells, thereby inducing weight loss and improvement of obesity-related comorbidities.[21,22] However, there still remains controversy about the exact effect of SG on postoperative GERD symptoms. In a previous systematic review in 2011, Chiu et al[23] found differing outcomes among the studies analyzing GERD and SG, and conclude that the evidence of the effect of SG on GERD did not consolidate to a consensus. In the past three years, multiple retrospective and prospective studies have reported on the influence of laparoscopic SG on GERD, including studies using objective esophageal function tests. The aim of this study is to evaluate the effect of laparoscopic SG on postoperative GERD symptoms in (morbidly) obese patients by systematically reviewing the current available literature concerning this important topic.

Patients and Methods

Literature search

Two authors (J.O. and D.R.) independently performed a literature search to identify studies investigating GERD in obese patients undergoing laparoscopic sleeve gastrectomy (LSG) with a BMI of more than 35. Both authors were experienced with performing systematic reviews and meta-analyses. MEDLINE databases were searched for papers published between November 2005 and November 2014, using the following keywords: "sleeve gastrectomy" AND "Gastroesophageal reflux" (Mesh). Free text words, including sleeve gastrectomy or gastric sleeve, were also used instead of Mesh terms to avoid missing recent articles that had not yet been given a Mesh label. EMBASE database was searched with the following terms: sleeve gastrectomy and gastroesophageal reflux. CINAHL database was also checked for relevant studies with the following keywords: "sleeve gastrectomy" AND "gastroesophageal reflux disease". The Cochrane database of Systematic Reviews was searched with the following words: "sleeve gastrectomy" AND "gastroesophageal reflux disease." The search was not restricted to any language, but in the systematic review, only studies published in English were taken into account.

Validity assessment

After identifying relevant titles, all abstracts were read and eligible articles were retrieved. A manual cross-reference search of the references of relevant articles was performed to identify other studies not found in the search. Only studies published in English were included. No unpublished data were included. A full search strategy is available at request. Two authors independently assessed the methodological quality of the articles using the checklist of the Cochrane collaboration and MINORS quality score, with a global ideal score of 16 for non-comparative studies and 24 for comparative studies.[24]

Definition

GERD is defined as the condition developing when reflux of stomach contents causes the characteristic symptoms retrosternal burning (heartburn) and regurgitation. Recalcitrant GERD concerns GERD symptoms not adequately responding to medical therapy. GERD symptoms can be diagnosed through patient symptom reporting, chart review, or standardized questionnaires. A patient was considered "obese" and "morbidly obese" if the patient had a BMI of more than 30 and more than 35, respectively. LSG is defined as the (standalone) laparoscopic surgical technique in which the stomach is vertically divided, leading to an average reduction in stomach size of approximately 25% of the original size.

Inclusion and exclusion criteria

Types of studies. Articles were eligible for inclusion if the following criteria were met: 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 available full text. The following exclusion criteria were used for study selection: abstracts, case series, articles describing laparoscopic SG after prior fundoplication, laparoscopic SG with concomitant antireflux procedures, laparoscopic SG following previous surgical bariatric procedures, open SG, and non-English articles.

Types of participants. The types of participants were obese and morbidly obese patients (BMI $>$ 30 and BMI $>$ 35, respectively) undergoing laparoscopic SG.