**Introduction**

Bariatric surgery with the Roux-en-Y gastric bypass (RYGB) and the Sleeve Gastrectomy (SG) has been proven to reduce the complications of obesity. However, recent literature suggests SG may actually exacerbate or cause GERD. Does the SG procedure contribute to laryngopharyngeal reflux as well?

Laryngopharyngeal reflux (LPR) or extraesophageal reflux disease is due to retrograde flow of gastric contents into the larynx and pharynx leading to a constellation of symptoms including hoarse voice, sore throat, dysphagia, dyspnea, cough, globus pharyngeus, bitter taste, sinusitis and postnasal drip. There is a higher prevalence of laryngeal findings in patients who suffer from LPR including Reinke’s edema, pseudosulcus, subglottic stenosis, interarytenoid thickening, ventricular obliteration, vocal cord nodules and granulomas, contact ulcers, and laryngeal carcinoma. LPR is thought to be a supra-esophageal manifestation of Gastro-Esophageal Reflux Disease (GERD), and Groome et al. found that the prevalence of LPR increases with the severity of GERD. Since obesity has been established as an important risk factor for GERD, it is expected that excessive body weight is also linked to LPR and its associated laryngeal findings. Accordingly, weight reduction may be a promising therapy for overweight patients suffering from symptoms associated with both GERD and LPR. However, the limited analyses are controversial in showing that obesity is a cause of LPR.

Belafsky et al. established the Reflux Symptom Index (RSI) as a measure of symptom severity in LPR. This study concluded that this nine-question assessment is highly reproducible with excellent construct based and criterion-based validity. They found that an RSI score greater than 13 is abnormal, as some degree of reflux is present in normal individuals. Studies have shown that RSI scores have improved with PPI treatment prior to resolution of physical findings associated with LPR (7 of belafsky). Although the link between RSI scores and objective exam findings is not extensive, we used RSI as a surrogate marker for LPR in this pilot study of bariatric patients.

**Objectives**

1. Assess symptoms of Laryngopharyngeal Reflux (LPR) in obese patients before and after bariatric surgery, correlating symptoms over time with BMI for 2 procedures: Roux-en-Y Gastric Bypass (RYGB) versus Sleeve Gastrectomy (SG).
2. Further explore the relationship between obesity and LPR, as well as the proposed pathophysiological mechanism.

**Study Design and Methods**

Following Institutional Review Board (IRB) approval, twelve patients were enrolled in a prospective cohort study to evaluate the effects of bariatric surgery on LPR. Patients underwent either RYGB (n=6) or SG (n=6) between February 2014-June 2014. Pre-operatively and at multiple post-operative visits, BMI and reflux symptoms, using the Reflux Symptom Index (RSI), were recorded.

**Results**

Mean age for all patients was 38.2 ± standard deviation 9.8 years. Both surgical groups included five females and one male. Average pre-operative BMI was 41.8 ± 4.28 kg/m² and RSI score was 12.1 ± 12.6; neither measure differed statistically between surgical groups (both p=0.24). In the RYG group, RSI scores over time showed a steep declining slope (b=-5.47), decreasing 1.27 points per unit BMI lost. In the SG group, RSI scores decreased over time, but it was less severe (b=-2.47), decreasing 0.97 points per unit BMI lost.

**Discussion**

Our results suggest that weight loss contributes to improved symptoms of LPR. The mechanism is likely multifactorial as obesity and excess abdominal adiposity causes increased intra-gastric pressure and thus increased reflux of gastric contents. Also, the pressure of the lower esophageal sphincter (LES) is decreased with the inflammatory humoral mediators of obesity and a lower parasympathetic tone. However, symptomatic improvement of LPR was likely due to more than just obesity itself, as the SG cohort did not improve as drastically as the RYGB cohort per weight loss. This is possibly due to the increased intra-gastric pressure with SG leading to a pressure gradient at the LES.

In the future, it would be optimal to design a larger study that analyzes weight change with subjective RSI assessment as well as findings on endoscopy, laryngeal pH measures, and phonatory assessment including harmonics-to-noise ratio, jitter, shimmer, and maximum phonation times. Such evaluations may play a significant role in helping to determine appropriate bariatric surgical recommendations. Further studies may also be able to indicate at which RSI should patients undergo a RYGB over SG procedure. Also, the link between voice quality and obesity could be further examined in the bariatric population.

To provide more quality patient care and to further characterize the association between obesity and LPR, a collaborative, multidisciplinary team of bariatric surgeons, gastroenterologists, and otolaryngologists will be crucial.

**Conclusions**

Using RSI as a surrogate measure of LPR, our study found a steady decrease in RSI with weight loss after bariatric surgery. This appeared to be more pronounced in the RYGB cohort compared to SG group. Our results suggest that obesity is related to symptoms of LPR, but much is unknown regarding the mechanism and its association with voice quality.

**References**