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Original article

# Evaluation of gastroesophageal reflux before and after sleeve gastrectomy using symptom scoring, scintigraphy, and endoscopy

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## Abstract

**Background:** The effect of laparoscopic sleeve gastrectomy (SG) on gastroesophageal reflux disease (GERD) has been a controversial issue. There have been limited studies on this aspect and most of the published studies are retrospective. Therefore, a prospective study was designed to objectively assess the problem. The objective of this study was to assess the impact of SG on symptoms of gastroesophageal reflux using questionnaire, endoscopy, and radionuclide scintigraphy.

**Methods:** Thirty-two patients undergoing laparoscopic sleeve gastrectomy were assessed for gastroesophageal reflux using Carlsson Dent Questionnaire and GERD questionnaire before and after surgery at three monthly intervals. They were also subjected to upper GI endoscopy (UGIE) and radionuclide scintigraphy both pre- and postoperatively.

**Results:** Mean preoperative weight and body mass index were 126.5 kg and 47.8 kg/m<sup>2</sup>, respectively. Mean percent excess weight loss at 12 months was 64.3 ± 18.4. Both the Carlsson Dent Score (CDS) and Severity Score (SS) exhibited a decline from 2.88 to 1.63 ( $p < 0.05$ ) and 2.28 to 1.06 ( $p < 0.05$ ), respectively after 12 months. Radionuclide scintigraphy revealed a significant rise of GERD from 6.25% to 78.1% in the postoperative period ( $p < 0.001$ ). UGIE showed a rise in incidence of esophagitis from 18.8% to 25%; however, there was improvement in all patients except one in terms of reduction of severity of esophagitis.

**Conclusion:** Presence of GERD may not be considered as a contra-indication for sleeve gastrectomy. There is improvement of GERD as assessed by symptom questionnaires, as well as improvement in grade of esophagitis. The new onset GERD detected on scintigraphy may not be pathologic as there is a decrease in total acid production postsurgery; however, it still remains an important issue and needs long-term follow-up. (Surg Obes Relat Dis 2014;■:00–00.) © 2014 American Society for Metabolic and Bariatric Surgery. All rights reserved.

**Keywords:** Sleeve gastrectomy; Gastroesophageal reflux; Endoscopy; Scintigraphy

Morbidly obese patients have an increased prevalence of reflux symptoms and esophagitis [1]. The presence of gastroesophageal reflux disease (GERD) in such patients may affect the choice of weight loss procedure. Roux-en-Y

gastric bypass has been favored by some over sleeve gastrectomy (SG) in morbidly obese patients with GERD [1]. The effect of SG on GERD has been one of the points for criticism of the procedure; however, there is a paucity of prospective studies which have analyzed the problem of GERD after SG as a primary endpoint [2–7]. SG has carved its own niche as a sole weight loss procedure and has been rapidly adopted by surgeons worldwide [8–11]. Besides excellent weight loss, SG results in remarkable resolution/

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improvement of co-morbidities among morbidly obese individuals [10–15]. Since the impact of SG on GERD remains an unresolved issue, this prospective study was undertaken to objectively determine the problem of reflux in patients undergoing SG using symptom questionnaires, radionuclide scintigraphy, and upper gastrointestinal endoscopy (UGIE).

## Methods

Thirty-five patients undergoing laparoscopic sleeve gastrectomy for morbid obesity were enrolled for the study and followed up for one year. We followed the standard National Institutes of Health Guidelines, which included patients with morbid obesity, defined as Body Mass Index (BMI)  $>40 \text{ kg/m}^2$ , patients with BMI  $>35 \text{ kg/m}^2$  with obesity related co-morbidities. Patients with symptomatic GERD and/or hiatus hernia were not excluded [fig. 1](#).

A detailed preoperative evaluation was done. The sleeve was created in the standard fashion over a 36-F bougie starting at 4–5 cm from pylorus. The staple line was not reinforced. Hiatal hernia, if present, was not repaired in any of the patients as it was deemed small in all patients.

### Evaluation of gastroesophageal reflux (GER) symptoms

For the purpose of the study, all patients underwent assessment of reflux symptoms using two different questionnaires; GERD questionnaire [16,17] to assess Symptom-Severity (SS) score and Carlson Dent self-administered questionnaire [18]. The GERD questionnaire uses a grading of symptoms of heartburn and regurgitation ([Table 1](#)). A severity score  $\geq 4$  is considered positive for GERD. The Carlsson Dent Questionnaire ([Table 2](#)) was given to the patient and the Carlsson Dent Score (CDS) was calculated from the responses given. A patient with a score

of  $> seven$  was considered to have GERD. The copyrights registration for both the questionnaires were done and submitted to the ethics committee of the institute. The study was approved by the institutional ethics committee (Ref no.269/01.07.2011).

Patients were followed up at three monthly intervals and at each visit symptom questionnaires were administered and scores were documented. Additionally, all patients underwent upper gastrointestinal endoscopic (UGIE) examination and scintigraphy in the preoperative period as well as at six months after SG. On UGIE, severity of esophagitis was graded according to the Los Angeles (LA) scoring system on a scale from A through D [19]. For scintigraphy, a validated method for the objective study of GERD [6,20], the patients were given a capsule containing the radioactivity at a dose of .5 mci in the form of Tc99-labeled sulfur colloid. It was followed by 400 milliliters (mL) of orange juice. Data acquisition was carried out with a frame rate of 10 s/frame for 15 min. The GERD index was calculated as follows: Background corrected esophageal counts/Background corrected total gastric counts  $\times 100\%$ . A GERD index of  $\geq 4$  was used as the cutoff to determine positivity for GERD. The result was noted as presence or absence of reflux.

### Statistical analysis

All data were prospectively collected and continually updated in a computer database using the Microsoft Office Excel program, and then analyzed using STATAv12 and IBM SPSS v20 (data analysis and statistical software). Data was analyzed first by using descriptive statistics. The pairwise comparison at 12 months was done for CDS and SS using related samples Wilcoxon signed rank test. McNemar test was applied to see the changes in qualitative data. Differences were considered statistically significant for  $p$ -values  $< .05$ .

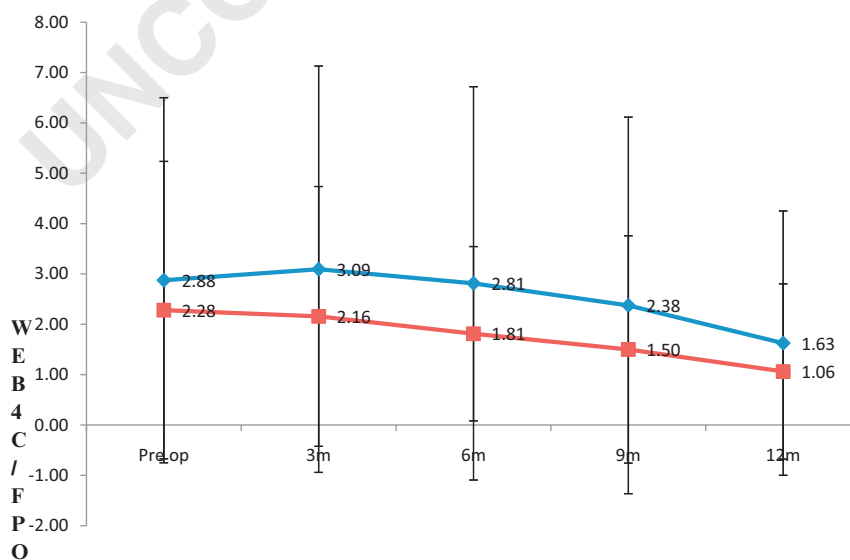


Fig. 1. Trend of mean Carlsson Dent Score (CDS) and mean Severity Score (SS) of patients

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