

Southwestern Surgical Congress

# A comparison of postoperative effects of bariatric surgery on medical markers of morbidity



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## KEYWORDS:

Bariatric surgery;  
LDL particle;  
Cholesterol;  
Obesity;  
Cardiovascular risk

## Abstract

**BACKGROUND:** Bariatric surgery reduces the prevalence of diabetes and improves lipid profiles. Low-density lipoprotein particle (LDL-P) is a more accurate predictor of cardiovascular events than high-density lipoprotein (HDL) and LDL cholesterol. The effects of bariatric procedures on LDL-P have not been previously reported.

**METHODS:** Two hundred thirty patients undergoing bariatric surgery, including gastric bypass, sleeve gastrectomy, and laparoscopic adjustable gastric band placement at a single institution were included. HDL, LDL, hemoglobin A1c, and LDL-P were measured preoperatively and at 3, 6, and 12 months postoperatively. Weight was recorded at baseline and after 1 year.

**RESULTS:** There was a decrease in serum LDL-P levels, averaging 472.58 ( $P < .0001$ ) over 1 year. HDL levels increased. Hemoglobin A1c and LDL levels declined. On average, patients lost 58% of excess weight.

**CONCLUSION:** LDL-P significantly decreased after bariatric surgery in relation to weight loss. It may be inferred that bariatric surgery decreases the risk of cardiovascular events.

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Obesity and its resultant morbidities undoubtedly comprise one of the gravest public health issues facing the medical community today. Hyperlipidemia, hyperglycemia, hypothyroidism, and hypertension are more prevalent in obese individuals. Bariatric surgery is proven to be

an effective treatment for obesity that results in sustained weight loss, comorbidity reduction, and diminished risk factors for related complications.<sup>1</sup>

Numerous studies have demonstrated recovery from and even resolution of diabetes mellitus after bariatric surgery.<sup>2-4</sup> Data also suggest that bariatric surgery improves lipid profiles and thus decreases cardiovascular risk factors.<sup>5,6</sup> This effect is especially important as coronary artery disease and stroke are the first and fourth leading causes of death in the United States, respectively.

The authors declare no conflicts of interest.

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Manuscript received March 28, 2014; revised manuscript September 12, 2014

The traditional approach to determining the risk of cardiovascular disease has included the measurement of low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein (HDL) cholesterol. However, the success of therapies directed against these 2 entities has been somewhat disappointing.<sup>7</sup> Advanced lipoprotein testing is a relatively new modality to measure subpopulations of cholesterol to more accurately predict future cardiovascular risk.<sup>8</sup> LDL particles (LDL-P) are atherogenic and can be characterized by total number as well as by size. Nuclear magnetic resonance (NMR) spectroscopy is one available method to quantify LDL-P that has proven to be a strong predictor of cardiovascular disease.<sup>9</sup>

The objective of this retrospective review was to ascertain if bariatric surgery improved medical markers of morbidity. Numerous laboratory values were compared preoperatively and at specific intervals postoperatively. In addition to already extensively studied markers such as hemoglobin A1c, HDL cholesterol, and LDL-C, we examined LDL-P. Furthermore, outcomes for the 3 bariatric procedures performed at a single institution were compared to investigate their respective efficacy at improving these laboratory values at 1 year postoperatively.

Our main hypothesis was that bariatric surgery would improve all 4 medical markers of medical morbidity. We also suspected that the malabsorptive component of bariatric surgery, seen with Roux-en-y gastric bypass (RYNGB), would result in a more marked improvement in these laboratory values than purely restrictive procedures.

## Methods

### Patient selection

This study undertook a retrospective chart review of all patients undergoing bariatric surgery at a designated center of excellence over an 18-month period. The inclusion criteria were patients who underwent RNYGB, sleeve gastrectomy, or laparoscopic adjustable gastric band placement (LBP) between January 2011 and June 2012 at Scott & White Memorial Hospital in Temple, Texas. The only exclusion criteria were patients receiving some combination of these 3 procedures that could no longer be classified discretely. A total of 230 patients

were studied; the body mass index (BMI) of the population ranged from 30 to 82. The project was reviewed and approved by both the institutional review board and the research compliance office at Scott & White Healthcare.

### Surgical procedures

Three surgeons (R.E.S., J.A.R., and R.O.C.) performed all the procedures laparoscopically. Gastric bypass was performed in an antecolic antegastric fashion with end-to-end anastomosis-stapled gastrojejunostomy using staple line reinforcement. Sleeve gastrectomy was performed with staple line reinforcement after mobilization of the greater curve of the stomach from 6 cm proximal to the pylorus and with an Olympus dual lumen therapeutic gastroscope as a 13 mm/39 French luminal size guide. Adjustable gastric bands were placed in a standard pars flaccida technique.

### Treatments

All patients underwent a standardized preoperative regimen including entry-level participation in seminars, lifestyle change classes, dietary counseling and education, mental health clearance, and intensive clinical investigation with medical clearance as deemed appropriate. All patients are expected to follow a regimented longitudinal follow-up protocol. Baseline demographic data and past medical history were obtained; these are displayed in [Table 1](#). Notably, the difference in the average BMI for the 3 different procedures was statistically significant with higher BMI patients opting for either RYNGB or laparoscopic sleeve gastrectomy (LSG).

Laboratory values were collected, per treatment protocol, preoperatively and again postoperatively at the 3-, 6-, and 12-month office visits. These values included HDL, LDL-P, LDL-C, and hemoglobin A1c, as well as thyroid stimulating hormone, parathyroid hormone, B12, ferritin, complete blood count, and complete metabolic panel.

All blood samples were analyzed at our institution with the exception of HDL, LDL-C, and LDL-P. These values were obtained from the NMR LipoProfile Test patented by LipoScience Incorporated in Raleigh, North Carolina.

**Table 1** Demographic data and medical morbidity

|                         | Roux-en-Y gastric bypass | Sleeve gastrectomy | Lapband placement | P value |
|-------------------------|--------------------------|--------------------|-------------------|---------|
| Number of patients      | 126                      | 31                 | 73                | <.00001 |
| Female                  | 88%                      | 77%                | 93%               | .07887  |
| Percent Caucasian       | 63%                      | 61%                | 55%               | .24394  |
| Average age             | 42                       | 45                 | 45                | .13503  |
| Average BMI             | 48                       | 49                 | 42                | <.00001 |
| Diabetes                | 25%                      | 35%                | 34%               | .3102   |
| Hypertension            | 58%                      | 77%                | 64%               | .12382  |
| Hyperlipidemia          | 55%                      | 58%                | 49%               | .65243  |
| Coronary artery disease | 3%                       | 10%                | 3%                | .19342  |

BMI = body mass index.

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