

To Study the Effect of Laparoscopic Sleeve Gastrectomy on BMI and Metabolic Parameters in Morbidly Obese Patients

Aayushi Kedawat¹, Sanjay Singhal², Shireesh Gupta³, Rajkamal Kanojiya⁴

ABSTRACT

Introduction: Obesity for centuries has had myriad implications on physical, mental, and psychosocial health. Various therapies like nutritional therapy, physical activity, pharmacotherapy, and cognitive-behavioral therapy have failed in managing obesity and lead to disappointing results. Contrary to these results, bariatric surgery has shown to have a decrease in weight of 50–75%. Not only has bariatric surgery been effective in morbid obesity but it also plays a significant role in a high rate of remission of type 2 diabetes mellitus and other obesity-related comorbidities like dyslipidemia, hypertension, and obstructive sleep apnea (OSA) syndrome.

Materials and methods: This is a prospective study, undertaken in Mahatma Gandhi Medical College and Hospital, Jaipur, from July 2017 to September 2019 after taking clearance from the Institution ethics committee. A total of 30 patients were included in this study who were morbidly obese with metabolic syndrome. The indications for surgery were according to the latest guidelines issued by the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) for the Asian population.

Results: There was a significant fall in all parameters like weight, body mass index (BMI), fasting blood sugar (FBS), HbA1c, hypertension, and dyslipidemia. The weight loss and BMI baseline were seen by the end of 12 months were 40 ± 9.3 kg and from 43.23 to 29.75, respectively, showing its statistical significance. There was a substantial decrease in baseline fasting sugar from 172 ± 19.7 to 139 ± 17.2 mg/dL. Simultaneously, a fall in HbA1c values was seen from the mean of 8.67 ± 1.1 to 6.18 ± 0.4 at the end of 1 year. There is a noteworthy improvement seen in hypertension by the end of 3rd month with mean systolic coming down to 131 ± 14 mm Hg and diastolic to 77 ± 11 mm Hg. Dyslipidemia seen in 21 patients out of 30 patients saw a 100% improvement. Therefore, laparoscopic sleeve gastrectomy (LSG) plays a vital role in reducing morbidity and mortality by effective weight loss and control of comorbid diseases.

Keywords: Body mass index, Laparoscopic sleeve gastrectomy, Obesity.

Journal of Mahatma Gandhi University of Medical Sciences & Technology (2019): 10.5005/jp-journals-10057-0108

INTRODUCTION

Obesity is a fairly prevalent but often belittled health condition across various countries of the world. There isn't any doubt that obesity in India is causing a major burden in the health care sector. It not only causes various comorbidities like hypertension, hyperlipidemia, type 2 diabetes mellitus (T2DM), arthritis, various cardiovascular and cerebrovascular events but also infertility and various malignancies like breast and ovarian carcinoma. Serious implications are placed on psychosocial health mainly due to the prejudice that exists in the society against fatness.^{1–6} The obese category is subdivided into obese class I (30–34.9 kg/m²), obese class II (35–39.9 kg/m²), and obese class III (≥ 40 kg/m²).⁷ A body mass index (BMI) >28 kg/m² in adults is associated with a three- to four-fold greater risk of morbidity due to T2DM and CVDs than in the general population. Various behavioral therapies like nutritional therapy, physical activity, and cognitive behavioral therapy that target lifestyle for treating obesity or overweight have always been used but the results vary depending on the person's determination, willingness, and most of the time end up with unsatisfactory results. Adjunct to lifestyle modifications, pharmacotherapy can also be used for weight loss. These approaches result in a 5–10% weight loss that tends to wane off over time. On the contrary, bariatric surgery leads to 50–75% of excess body weight loss, which is durable as well as significant. Hence, as per the recent international guidelines, bariatric surgery has been declared the most effective treatment for morbid obesity. Various studies suggest that bariatric surgery results in a high rate of remission of T2DM and other obesity-related comorbidities like dyslipidemia, hypertension, and obstructive

^{1–4}Department of General Surgery, Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur, Rajasthan, India

Corresponding Author: Sanjay Singhal, Department of General Surgery, Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur, Rajasthan, India, Phone: +91 9829152496, e-mail: drsanjaymeenakshi@yahoo.com

How to cite this article: Kedawat A, Singhal S, Gupta S, *et al.* To Study the Effect of Laparoscopic Sleeve Gastrectomy on BMI and Metabolic Parameters in Morbidly Obese Patients. *J Mahatma Gandhi Univ Med Sci Tech* 2019;4(3):61–63.

Source of support: Nil

Conflict of interest: None

sleep apnea syndrome (OSA). The short-term and long-term outcomes of bariatric surgery lead to an improvement in glucose metabolism, insulin resistance, and quality of life.

MATERIALS AND METHODS

This is a prospective study, undertaken in Mahatma Gandhi Medical College and Hospital, Jaipur from July 2017 to September 2019 after taking clearance from the institution ethics committee. A total of 30 morbidly obese patients with metabolic syndrome were included in the study after taking informed consent.

Inclusion Criteria

- Both males and females, between 18 and 65 years old.
- The indications for surgery will take into account the latest guidelines issued by the International Federation for the

Surgery of Obesity and Metabolic Disorder (IFSO) for the Asian population, i.e.,

- BMI >35 kg/m² regardless of comorbidities.
- BMI >30 kg/m² with comorbidities.
- Patients with metabolic syndrome (T2DM, hypertension, hyperlipidemia) labeled as per the guidelines of the American Heart Association (AHA) which requires the presence of three out of the following five conditions:
 - Fasting glucose ≥100 mg/dL (or receiving drug therapy for hyperglycemia).
 - Blood pressure ≥130/85 mm Hg (or receiving drug therapy for hypertension).
 - Triglycerides ≥150 mg/dL (or receiving drug therapy for hypertriglyceridemia).
 - HDL-C <40 mg/dL in men or <50 mg/dL in women (or receiving drug therapy for reduced HDL-C).
 - Waist circumference ≥102 cm (40") in men or ≥88 cm (35") in women; if Asian American, ≥90 cm (35") in men or ≥80 cm (32") in women.

Exclusion Criteria

- Psychiatric patients (lack of compliance).
- Bleeding disorders.
- Multiple previous abdominal surgeries.
- Stroke with active anticoagulant therapy.
- Immunocompromised patients.

RESULTS

Weight, BMI and Diabetes Mellitus

The mean weight loss during the first 3 months was substantially more in comparison to the following months with mean weight reduced from 130 to 110 kg by the end of 3rd month. Following this period, by the end of 12 months, the mean weight loss of 40 ± 9.3 kg was seen with a reduction in baseline BMI from 43.23 to 29.75. The study concluded that the weight loss and reduction of BMI at the end of the 12th month was statistically significant with *p* value <0.0005 (Tables 1 to 4).

Table 1

| | Weight | | | |
|------------|--------|---------|---------|----------|
| | Mean | SD | F value | p value |
| Baseline | 130.67 | 15.9034 | 490.453 | 0.0005** |
| 3rd month | 110.43 | 13.5918 | | |
| 6th month | 101.10 | 11.6748 | | |
| 12th month | 90.13 | 9.3245 | | |

**Highly significant at *p* < 0.01 level

Table 2

| | Body Mass Index | | | |
|------------|-----------------|---------|---------|----------|
| | Mean | SD | F value | p value |
| Baseline | 43.23 | 3.34057 | 715.083 | 0.0005** |
| 3rd month | 36.60 | 2.80488 | | |
| 6th month | 33.58 | 2.70327 | | |
| 12th month | 29.75 | 2.11669 | | |

**Highly significant at *p* < 0.01 level

In our study, all patients selected had DM with poor glycemic control. All these patients were either on oral hypoglycemic drugs or insulin. Mean baseline fasting blood sugar (FBS) was 172 ± 19.7 mg/dL that decreased to 139 ± 17.2 mg/dL at the end of 3 months and dropped to 116.4 ± 5 mg/dL by 12 months. Simultaneously, a fall in HbA1c values was seen from a mean of 8.67 ± 1.1 to 6.18 ± 0.4 at the end of 1 year.

Hypertension

In our study, all patients selected were hypertensive. Out of 30, 9 patients had their hypertension diagnosed preoperatively after admission. And seven patients were under the category of uncontrolled hypertension and the remaining were on antihypertensive. The mean baseline systolic BP (SBP) was 154 ± 21 mm Hg and the mean baseline diastolic BP was 88 ± 11 mm Hg. Significant improvement in hypertension was seen by the end of 3rd month with mean systolic coming down to 131 ± 14 mm Hg and diastolic to 77 ± 11 mm Hg. All patients showed improvement or resolution by the end of 1 year after LSG (Tables 5 to 8).

Hypertriglyceridemia

In our study, out of 30 patients, 21 were diagnosed with dyslipidemia. Improvement in lipid parameters was seen in 100% of them. None of the patients required any medication after 12 months of surgery. Serum cholesterol was seen to decrease in all patients and reached within normal limits after 12 months. Improvements in serum triglycerides were seen from a baseline of 172.53 ± 11.5 to 144 ± 6.6 mg/dL. Total cholesterol was seen to reduce from a baseline of 268.44 ± 66.60 to 156.33 ± 21 by the end of 1 year. An increment in serum HDL levels was seen in all the patients from a

Table 3

| | Fasting Blood Sugar | | | |
|------------|---------------------|---------|---------|----------|
| | Mean | SD | F value | p value |
| Baseline | 172.40 | 19.7058 | 149.752 | 0.0005** |
| 3rd month | 139.80 | 17.2695 | | |
| 6th month | 121.60 | 8.7871 | | |
| 12th month | 116.47 | 5.8941 | | |

**Highly significant at *p* < 0.01 level

Table 4

| | HbA1c | | | |
|------------|-------|--------|---------|----------|
| | Mean | SD | F value | p value |
| Baseline | 8.67 | 1.1985 | 145.253 | 0.0005** |
| 3rd month | 7.38 | 0.9791 | | |
| 6th month | 6.71 | 0.7246 | | |
| 12th month | 6.18 | 0.4191 | | |

**Highly significant at *p* < 0.01 level

Table 5

| | Systolic Blood Pressure | | | |
|------------|-------------------------|---------|---------|----------|
| | Mean | SD | F value | p value |
| Baseline | 154.60 | 21.3761 | 12.265 | 0.0005** |
| 3rd month | 131.73 | 14.9734 | | |
| 6th month | 134.53 | 15.0945 | | |
| 12th month | 131.47 | 14.6022 | | |

**Highly significant at *p* < 0.01 level

Table 6

| <i>Diastolic Blood Pressure</i> | | | | |
|---------------------------------|-------------|-----------|----------------|----------------|
| | <i>Mean</i> | <i>SD</i> | <i>F value</i> | <i>p value</i> |
| Baseline | 88.33 | 11.4390 | 5.544 | 0.002** |
| 3rd month | 77.67 | 11.2291 | | |
| 6th month | 83.63 | 10.9087 | | |
| 12th month | 78.90 | 11.3634 | | |

**Highly significant at $p < 0.01$ level

Table 7

| <i>Subtotal Gastrectomy</i> | | | | |
|-----------------------------|-------------|-----------|----------------|----------------|
| | <i>Mean</i> | <i>SD</i> | <i>F value</i> | <i>p value</i> |
| Baseline | 172.53 | 11.5780 | 323.858 | 0.0005** |
| 3rd month | 163.83 | 9.5234 | | |
| 6th month | 153.20 | 7.5767 | | |
| 12th month | 144.00 | 6.6540 | | |

**Highly significant at $p < 0.01$ level

Table 8

| <i>Skelotonization of the Hepatoduodenal Ligament</i> | | | | |
|---|-------------|-----------|----------------|----------------|
| | <i>Mean</i> | <i>SD</i> | <i>F value</i> | <i>p value</i> |
| Baseline | 24.00 | 5.2066 | 47.608 | 0.0005** |
| 3rd month | 34.55 | 3.7147 | | |
| 6th month | 45.60 | 3.2863 | | |
| 12th month | 46.33 | 2.9046 | | |

**Highly significant at $p < 0.01$ level

baseline of 42.17 ± 5.2 to 46.87 ± 29 mg/dL. A drop in the serum LDL levels was seen after 12 months from a baseline level of 106.64 ± 38.76 to 77.33 ± 98 mg/dL.

DISCUSSION

Weight loss is the most important parameter of bariatric surgery operations, and it is the parameter by which success or failure of weight-reducing techniques is measured. In our study, 100% of patients lost >50% of their excess weight 6 months after surgery. The mean weight loss at 3 and 6 months was 18.92 and 42.20 kg, the mean %EWL at 3 and 6 months was 32.21 and 65.05%, respectively. Laparoscopic sleeve gastrectomy may induce weight loss by reducing food intake, but in accelerated gastric emptying, delivery of nutrients to the small intestine early in the eating cycle could activate small intestine satiety inducing chemoreceptors that could modify food ingestion periodicity.

Eight of the 16 diabetic patients had resolution of diabetes at 3 months, 13 patients had resolution after 6 months, and improvement was seen in all the 16 patients. There was a reduction in the requirement of drugs in the remaining three patients. In the present study, out of 16 patients, 14 had remission of diabetes; of the remaining 2 patients, 1 was on metformin only and the other patient on half the dose of insulin.

All patients (100%) with preoperatively diagnosed hypertension (16 out of 30) showed improvement or resolution. At 6 months, 62.5% of LSG patients had resolution of hypertension.⁸⁻¹⁴

SUMMARY AND CONCLUSION

Laparoscopic sleeve gastrectomy has emerged as a low morbidity bariatric surgical procedure that leads to effective weight loss and control of comorbid diseases. Most patients with DM, hypertension, and dyslipidemia showed resolution or improvement after LSG.

Therefore, for morbidly obese patients in the short-term, LSG is a very safe and effective procedure without any significant morbidity or mortality.

REFERENCES

- Nocca D, Krawczykowsky D, Bomans B, et al. A prospective multicenter study of 163 sleeve gastrectomies: results at 1 and 2 years. *Obes Surg* 2008;18(5):560–565. DOI: 10.1007/s11695-007-9288-7.
- Boza C, Salinas J, Salgado N, et al. Laparoscopic sleeve gastrectomy as a stand-alone procedure for morbid obesity: report of 1,000 cases and 3-year follow-up. *Obes Surg* 2012;22(6):866–871. DOI: 10.1007/s11695-012-0591-6.
- Srinivasa S, Hill LS, Sasmour T, et al. Early and mid-term outcomes of single-stage laparoscopic sleeve gastrectomy. *Obes Surg* 2010;20(11):1484–1490. DOI: 10.1007/s11695-010-0267-z.
- Prasad P, Tantia O, Patle N, et al. An analysis of 1-3-year follow-up results of laparoscopic sleeve gastrectomy: an Indian perspective. *Obes Surg* 2012;22(3):507–514. DOI: 10.1007/s11695-012-0599-y.
- Arias E, Martinez PR, Ka Ming Li V, et al. Mid-term follow-up after sleeve gastrectomy as a final approach for morbid obesity. *Obes Surg* 2009;19(5):544–548. DOI: 10.1007/s11695-009-9818-6.
- Aggarwal S, Kini SU, Herron DM. Laparoscopic sleeve gastrectomy for morbid obesity: a review. *Surg Obes Relat Dis* 2007;3(2):189–194. DOI: 10.1016/j.soard.2006.10.013.
- Shi X, Karmali S, Sharma AM, et al. A review of laparoscopic sleeve gastrectomy for morbid obesity. *Obes Surg* 2010;20(8):1171–1177. DOI: 10.1007/s11695-010-0145-8.
- D'Hondt M, Vanneste S, Pottel H, et al. Laparoscopic sleeve gastrectomy as a single-stage procedure for the treatment of morbid obesity and the resulting quality of life, resolution of comorbidities, food tolerance, and 6-year weight loss. *Surg Endosc* 2011;25(8):2498–2504. DOI: 10.1007/s00464-011-1572-x.
- Menenakos E, Stamou KM, Albanopoulos K, et al. 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;20(3):276–282. DOI: 10.1007/s11695-009-9918-3.
- Chowbey PK, Dhawan K, Khullar R, et al. Laparoscopic sleeve gastrectomy: an Indian experience-surgical technique and early results. *Obes Surg* 2010;20(10):1340–1347. DOI: 10.1007/s11695-009-9973-9.
- Lee CM, Cirangle PT, Jossart GH. Vertical gastrectomy for morbid obesity in 216 patients: report of two-year results. *Surg Endosc* 2007;21(10):1810–1816. DOI: 10.1007/s00464-007-9276-y.
- Skrekas G, Lapatsanis D, Stafyla V, et al. One year after laparoscopic "tight" sleeve gastrectomy: technique and outcome. *Obes Surg* 2008;18(7):810–813. DOI: 10.1007/s11695-008-9440-z.
- Pories WJ, Swanson MS, Macdonald KG, et al. Who would have thought it? an operation proves to be most effective therapy for adult diabetes mellitus. *An Surg* 1995;222(3):239–350. DOI: 10.1097/0000658-199509000-00011.
- WHO. Appropriate body mass index for Asian populations and its implications for policy and intervention strategies. *Lancet* 2004;363(9403):157–163. DOI: 10.1016/S0140-6736(03)15268-3.