

TO STUDY THE EFFECT OF LAPAROSCOPIC BARIATRIC SURGERY ON SERUM INSULIN LEVELS IN MORBIDLY OBESE PATIENTS

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ABSTRACT

BACKGROUND

Obesity has emerged as one of the most serious public health concerns in the 21st century. Obesity is a very important factor in the development of type 2 diabetes. The most commonly performed type of bariatric surgery, Roux-En-Y gastric bypass, improves diabetes not only through rapid weight-loss, but also by excluding (bypassing) a portion of the small intestine from the flow of nutrients. This means that gastric bypass surgery improves diabetes even before weight is lost. The production of various gut hormones is changed following gastric bypass, leading to improvement of insulin secretion. Weight loss is associated with an improvement in fasting glucose, insulin resistance and impaired dyslipidaemia.

Aim of the study is to evaluate the effect on serum insulin levels following laparoscopic bariatric surgery in morbidly obese patients at 1 month and 3 months post-op.

MATERIALS AND METHODS

The study was conducted in the Department of Surgery, DMCH, Ludhiana, on morbidly obese patients aged 37.4±15 years, who were admitted, during a period of 15 months, undertaken to monitor the metabolic responses of serum insulin level, and weight reduction, after laparoscopic bariatric procedure.

RESULTS

Out of 31, 20 (64.5%) patients were female and rest 11 were male. Mean age of patients was 46.94 ± 11.53 years. Mean height and weight was 1.65 ± 0.055 m and 126.13 ± 24.19 kg respectively. Mean BMI was 46.31±8.50 kg/m.² Out of 31 patients, 19 were hypertensive, and 14 were diabetics, on regular medications. All the 31 patients in this study with the mean serum insulin levels of 73.08 ± 27.80 preoperatively show significant fall in serum insulin levels at 1 month and 3 months (p= 0.00) postoperatively.

CONCLUSION

Laparoscopic bariatric surgery has resulted in resolution or decrease in doses of insulin in people who have T2DM.

KEYWORDS

Obesity, Laparoscopic, Insulin, Diabetes, Bariatric.

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BACKGROUND

Obesity has emerged as one of the most serious public health concerns in the 21st century. It is a leading preventable cause of death worldwide, with increasing rates in adults and children and is seen as one of the most serious public health problems of the 21st century.^[1] An obese person has double the risk of developing diabetes, and a severely obese person is at a tenfold increased risk.^[2] Recent studies show that fat tissues change following bariatric surgery, which leads to improvement of insulin resistance. Gastric bypass surgery improves diabetes even before weight is lost.

The production of various gut hormones is changed following gastric bypass, leading to improvement of insulin secretion. Insulin resistance is defined as the diminished ability of muscle and other insulin-responsive tissue to transport glucose from the bloodstream into the cell.^[3] The consequences of obesity and insulin resistance include high glucose and free fatty acid levels, elevated insulin and leptin concentrations and low adiponectin levels; other metabolic markers include high C-reactive protein (CRP) and tumour necrosis factor (TNF) alpha levels.^[4]

Surgical intervention in obesity is today the most effective treatment method in high level obesity management with long-term clinical results and satisfaction of operated patients.^[5] A high percentage of patients benefit from bariatric surgery procedures in terms of metabolic effect and substantial body mass index reduction. These procedures improve glucose metabolism leading to the amelioration or complete resolution of type 2 diabetes, reduction of insulin resistance and alleviation of metabolic syndrome effects. Bariatric surgery interventions not only ensure body weight reduction, but may influence lipid and saccharide metabolism as well.

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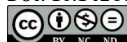
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Weight loss is associated with an improvement in fasting glucose, insulin resistance and impaired dyslipidaemia.^[6] Thus, it appears very important to evaluate rapid and significant reductions of weight after bariatric surgery techniques, on biochemical and anthropometric profiles in morbidly obese patients. Management of dyslipidaemia and insulin resistance is critically important in the prevention of many of these disorders including coronary artery disease in these patients.^[7] Increased serum levels of low density lipoprotein cholesterol (LDL-C) and/or serum triglycerides (TG) and decreased high-density lipoprotein cholesterol levels (HDL-C) are atherogenic and have frequently been reported in this population. Many studies have shown reduction in hepatic transaminase and Gamma-GT levels post-bariatric surgery. 20-30% of obese patients without concomitant liver disease show elevated liver tests (ALT, AST, and GGT) which are known to normalise after weight reduction.^[8]

MATERIALS AND METHODS

The study was conducted in the Department of Surgery, DMCH, Ludhiana, on morbidly obese patients aged 37.4 ± 15 years, who were admitted, during a period of 15 months, undertaken to monitor the metabolic responses of serum insulin level, and weight reduction, after laparoscopic bariatric procedure. This report presents the results of examined patients in 3 months after the operation. Interpretation was done on the basis of changes in Body Mass Index, Serum Insulin Levels, Lipid Profile and SGOT/SGPT in these patients.

Particulars of each patient were duly noted including name, age, sex, occupation, admission number, occupation and address for future correspondence. A written informed consent was taken from all the patients. Surgery will be performed according to patient's choice/subject to fitness.

Detailed history of each patient was obtained including history of presenting symptoms, any pre-existing comorbid conditions and the patient's past history including treatment and surgical history.

General physical examination and thorough systemic examination was done upon all patients at the time of admission. All necessary routine investigations were done. Pre-operatively and post-operatively at 1 month and 3 months, all patients underwent specific anthropometric measurements and laboratory investigations, as depicted in Table 1.

Parameters	Pre-Operative	Post-Operative	
		1 month	3 months
Weight (kg)	126.13	116.13	97.26
BMI (kg/m ²)	46.31	42.68	35.69
Serum insulin levels	73.08	67.73	56.53
SGOT	30.61	30.61	29.87
SGPT	29.39	29.45	27.97
Lipid Profile			
Serum triglycerides	169.16	159.39	150.48
Serum cholesterol	145.23	136.61	129.84
HDL	37	42.32	46.42
LDL	102.42	95.94	89.97

Table 1

The outcome of the study was assessed by monitoring the metabolic responses of serum insulin level and weight reduction after laparoscopic bariatric procedure. Appropriate statistical methods and tests were applied.

RESULTS

Out of 31, 20 (64.5%) patients were female and rest 11 were male. Mean age of patients was 46.94±11.53 years. Mean height and weight was 1.65±0.055 m and 126.13±24.19 kg respectively. Mean BMI was 46.31±8.50 kg/m². Out of 31 patients, 19 were hypertensive, and 14 were diabetics, on regular medications as shown in tables.

Number (n)	31
Mean Age (years)	46.94 ± 11.53
Mean Height (cm)	165 ± 5.5
Mean Weight (Kg)	126.13 ± 24.19
Mean BMI (kg/m ²)	46.31 ± 8.50

Table 2

Effect on Serum Insulin Levels

All the 31 patients in this study with the mean Serum Insulin Levels of 73.08±27.80 preoperatively show significant fall in Serum Insulin Levels at 1 month and 3 months (p=0.00) postoperatively as shown in Table 5 and Figure 10. This signifies that Laparoscopic Bariatric surgery resulted in resolution of insulin resistance following the procedure.

Serum Insulin Levels	Mean	Std. Deviation	N
Pre-op	73.08	27.80	31
Post-op month-1	67.73	29.03	31
Post-op month-3	56.53	28.12	31

Table 3. Effect on Serum Insulin Levels

Mean Weight Loss

Pre-operatively mean weight was 126.13± 24.19 kg. Significant weight loss was observed at 1 month and 3 months when mean weight was 116.13±22.99 kg & 97.26± 23.38 kg respectively. Thus, concluding that bariatric procedure results in effective weight loss.

Weight (kg)	Mean	Std. Deviation	N
Pre-op	126.13	24.19	31
Post-op month-1	116.13	22.99	31
Post-op month-3	97.26	23.38	31

Table 4. Mean Weight Loss

Effect on Body Mass Index (BMI)

BMI (Body mass index) is calculated by weight (in kg) divided by height (in m²). This is the main parameter depending upon which patient becomes eligible for bariatric surgery. Pre-operatively BMI was 46.31±8.50 kg/m². Significant reduction in BMI was observed at 1 month and 3 months when mean BMI was 42.68±8.11 kg/m² & 35.69±8.18 kg/m² respectively. Table 9 and figure 12 shows marked decrease in BMI of the patients at 1 and 3 months postoperatively which was statistically highly significant.

BMI (Kg/m ²)	Mean	Std. Deviation	N
Pre-op	46.31	8.50	31
Post-op month-1	42.68	8.11	31
Post-op month-3	35.69	8.18	31

Table 5. Effect on Body Mass Index

Effect on Serum Cholesterol

Serum cholesterol levels showed a significant improvement at the end of 1 month (mean: 136.61±40.20 mg/dL) when compared with pre-operative levels (mean: 145.23±45.73 mg/dL) and highly significant (p=.00) at 3 months (mean: 129.84±31.91 mg/dL).

S. Cholesterol	Mean	Std. Deviation	N
Pre-op	145.23	45.73	31
Post-op month-1	136.61	40.20	31
Post-op month-3	129.84	31.91	31

Table 6. Effect on Serum Cholesterol

Effect on Serum Triglycerides Levels

In our study, serum triglyceride levels showed improvement at the end of 1 month (mean: 159.39± 67.08 mg/dL) when compared with pre-operative levels (mean: 169.16 ± 73.72 mg/dL) and significant improvement (p=.000) at 3 months (mean: 150.48 ± 54.50 mg/dL).

Serum Triglycerides Levels	Mean	Std. Deviation	N
Pre-op	169.16	73.72	31
Post-op month-1	159.39	67.08	31
Post-op month-3	150.48	54.50	31

Table 7. Effect on Serum Triglycerides Levels

DISCUSSION

Success or failure of any weight reducing technique is measured by extent of reduction in body weight, which is an important parameter of this study. In our study, mean weight following Bariatric Surgery at 1 month and 3 months was 126.13±24.19 and 97.26±23.38 kg respectively. Most of the patients had lost more than 50% of the excess weight in 3 months following surgery with mean% excess weight loss (%EWL) at 1 month and 3 months being 19.13% and 56.78% respectively. There was a significant decrease in BMI at 3 months following Bariatric surgery in our study group with mean BMI at the end of 1 month and 3 months being 42.68 kg/m² and 35.69 kg/m² as compared to the pre-op values of 46.31 kg/m².

Similar results were found by Alagna et al.^[9] at mean 12±1 months after surgery, the patients showed a significant decrease in weight, from 132.1±36.9 before surgery to 93.5±20 kg (P<.0001), and BMI, from 47.3±13.1 before surgery to 33.5±7 (P <.0001).

Omana et al^[10] found similar results when studied men undergoing surgery lost weight; the percentage of excess weight loss was 61.48% (confidence interval [CI], 47.3875-75.5725).

Effect on Serum Insulin Level

There is abundant evidence from many centres indicating that type 2 diabetes can be cured by gastric bypass and by other forms of bariatric surgery.^[11-13] That this is achieved before appreciable loss of weight is an important clue to improving our understanding of insulin resistance. Whereas obesity is conventionally thought to produce insulin resistance, it may emerge that obesity is another manifestation of insulin resistance. Put simply, insulin resistance may cause obesity, not vice versa. It has been

postulated that gastric bypass improves diabetes through influences on the entero-insular axis, through a humoral effect.^[14-15]

In our study, there was significant reduction in levels of Serum Insulin Levels at 1 month and 3 months post-operatively in obese patients with mean Serum Insulin level at 1 month and 3 months being 67.73 and 56.53 respectively as compared to the mean pre-operative value of 73.08.

The decrease in insulin resistance after bariatric procedures results from multiple changes that occur post-operatively such as dietary control, decreased plasma ghrelin levels, which in turn leads to increase in maximal capacity of glucose-induced insulin release by the islet cells.

Effect of Serum Lipid Levels

Dyslipidaemia is a recognised cardiovascular risk factor in obese patients. In our study, there was a significant decrease in S. Cholesterol and S. Triglycerides levels at 3 months with a significant improvement in S.HDL levels. S.LDL levels also showed a decreasing trend; however, not statistically significant in this study, citing further followup to 1-2 years. Similar results were found in a study conducted by Chowbey et al who showed resolution of dyslipidaemia in 34% of the patients with significant decrease in mean cholesterol and LDL levels 6 months after LSG.^[16]

CONCLUSION

Laparoscopic bariatric surgery is a good weight loss technique for obese and super obese patients. It produces sustainable weight loss with lesser complications both intraoperatively and postoperatively with shorter hospital stay and improvement in insulin resistance. After Laparoscopic bariatric surgery, Serum Insulin Levels started returning to normal in majority of patients. This effect started occurring after 1 month of Laparoscopic bariatric surgery.

Laparoscopic bariatric surgery is effective in treating metabolic syndrome with resolution or improvement of glycaemic status in most cases 3 months after surgery. Laparoscopic bariatric surgery is highly effective for achieving weight loss in patients with morbid obesity. There was also significant improvement in their lipid profiles.

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