Does Abdominoplasty Intensify the Metabolic Effect of Bariatric Surgery?

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ABSTRACT **Background:** The effect of weight reduction following bariatric surgery is already well known.

Objectives: To investigate the effects of abdominoplasty on metabolic markers indicative of weight loss.

Methods: The authors prospectively enrolled consecutive obese patients after laparoscopic sleeve gastrectomy. They were candidates for post-bariatric surgery abdominoplasty. The authors measured metabolic markers one day prior to surgery, 24 hours after, and 3 months following surgery. They recorded medical and demographic parameters.

Results: Sixteen patients were recruited for participation in the study. Mean age was 47 years and 88% of the patients were female. Bariatric surgery achieved a mean decline in body mass index of 13.8 kg/m^2. All patients underwent abdominoplasty. Leptin and insulin levels were slightly increased at 3 months postoperative. No significant changes were observed in glucose, hemoglobin, or triglycerides throughout the study.

Conclusions: In a cohort of obese patients undergoing laparoscopic sleeve gastrectomy followed by abdominoplasty, no significant changes were noted in a patient's metabolic profiles. The results suggest that abdominoplasty has no effect on the metabolic markers tested in contrast to other reports; however, the cosmetic, behavioral, and psychological advantages of abdominoplasty are well established.

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KEY WORDS: abdominoplasty, bariatric surgery, body mass index (BMI), leptin, metabolic markers

The global obesity epidemic has increased drastically in the past several years and is predicted to continue to grow [1,2]. Currently, bariatric surgery is considered the most effective treatment for obesity. In recent years, vast amounts of research has been devoted to understanding the metabolic changes related to obesity [3]. In adults, obesity can present in a variety of ways. It is now known that the disease manifests not only by heavy weight and enlarged body contour, but also in the form of a metabolic syndrome characterized by all or some conditions including diabetes, hypertension, sleep apnea, and hyperlipidemia [4,5]. The development of obesity associated co-morbidities can often be explained by excess adiposity and deposition of fat tissue in key sites such as the abdomen, skeletal muscle, liver, kidney, and heart. Fat deposition can be associated with several metabolic abnormalities including altered adipokine profile, insulin resistance, and endothelial dysfunction [5-7]. Leptin, the satiety hormone, is secreted by adipocytes along with TNF-α, IL-6, resistin, and adiponectin, and provides negative feedback at the hypothalamic-pituitary axis to modulate appetite and energy expenditure. Some literature seems to suggest a link between inflammation and insulin resistance as well as obesity which all play a critical role in the pathogenesis of human disease [8-10]. Leptin levels increase as fat mass increases and vice versa. Other metabolic changes reported include a decrease in subcutaneous fat which is thought to regulate insulin activity through the neuroendocrine network in which leptin participates [11].

Although weight loss is achieved by a combination of decreased gastric size, malabsorption, and metabolic effect, as the popularity of bariatric procedures rises, we have seen an increase in the incidence of post-bariatric body contouring surgery. The surgical removal of abdominal subcutaneous fat through abdominoplasty is one of the most common post bariatric body contouring procedures. Through this procedure, variable amounts of adipose tissue and skin is removed from the body. The effect of abdominoplasty on leptin levels and other metabolic markers is not well documented. Some reports have demonstrated that removal of subcutaneous fat by liposuction is associated with a decrease in leptin levels and improves insulin resistance however, it is still controversial if it truly affects insulin resistance and if the leptin decline is lasting [12-14].

In the present study, we investigated the changes in leptin and insulin levels over time in relation to amount of fat removed, hemoglobin levels, body mass index (BMI) changes, and triglycerides.

PATIENTS AND METHODS

SAMPLE SELECTION

A total of 16 patients who underwent an abdominoplasty procedure at the plastic and reconstructive surgery unit between November 2015 and August 2018 were recruited. We only included patients who underwent a previous bariatric surgery with massive weight loss (between 22 and 62 kg) and were scheduled

Table 1. Demographic parameters, comorbidities

AGE (YEARS)	30 ± STANDARD DEVIATION
Female sex (%)	87.5
Co-morbidities Fatty liver Hyperlipidemia	 3 1
BMI prior to bariatric surgery	41 ± 5.4
BMI prior to abdominoplasty	27 ± 3.4
Removed tissue weight (grams)	1638 ± 749

BMI = body mass index

to undergo a pure abdominoplasty without ancillary procedures such as monsplasty or hernia repair. The study protocol was approved by the institutional review board of Wolfson Medical center and informed consent was obtained from each patient.

Patient demographics and preoperative data including age, height, weight at the time of surgery, maximal weight before the bariatric surgery, date and type of bariatric surgery, and general health condition were recorded. Venous blood samples were obtained after 10 hours overnight fast one day before, one day after, and 3 months after the abdominoplasty procedure.

SURGICAL PROCEDURE

The surgical procedure was performed by the same surgical team in all cases. Once informed consent was obtained, measurements and markings for the abdominoplasty procedure were performed on the day of surgery while the patient was standing in the upright position. In the operating room, after general anesthesia and orotracheal intubation were performed, sterilization of the patient's skin in the prone position was achieved by using povidone solution scrub followed by alcohol scrub. Skin cuts were performed according to the preoperative markings and abdominal flaps were raised. After tilting the operational bed, measuring and marking of the tissue excess was performed. After removal of tissue excess, its weight was determined to the nearest 0.001 kg using a calibrated balance scale. The umbilicus was repositioned, and the wounds were closed by layers.

ANALYSES OF BLOOD SAMPLES

Venous blood samples were drawn after a 10-hour overnight fast. The workup included complete blood count, chemistries (Sequential Multiple Analysis–Computer and lipid profile), insulin levels, and leptin. The leptin blood samples were stored at -80°C until required for analysis. We used a commercially available kit (Quantikine® Colorimetric Sandwich ELISA Kits, R&D Systems, USA) to determine serum leptin levels. The range of detection was 15.6–1000 pg/ml. the serum was diluted 1:100 before the analysis, and the assay was performed according to the manufacturer's protocol. Leptin values were determined using a microplate reader ELx800™ (BioTek Instruments, Inc., USA). Samples were tested in duplicates and the final values are the averages of each two results.

Patients were followed by the attending surgeon at 1, 3, and 6 months postoperatively. Data analyses including age, gender, BMI, past medical history and treatment were documented. Blood test results were collected at three time points: one day prior to surgery, one day after surgery, and 3 months post-surgery.

STATISTICAL ANALYSIS

Statistical analyses were performed using IBM Statistical Package for the Social Sciences statistics software, version 25 (SPSS, IBM Corp, Armonk, NY, USA).Distribution of variables was tested for normality using the Kolmogorov-Smirnov test, with a cutoff of $P < 0.01$. Parameters with normal distribution are described as means ± standard deviation, while parameters that deviate from normal distribution are described as median ± min/max. Categorical variables such as sex are described as number (frequency %). Associations between variables were measured using the Pearson or Spearman tests, accordingly. Continuous variables were tested across dichotomous groups using the *t*-test for independent samples or the Mann-Whitney U test accordingly. Associations between categorical variables were measured using the Chi-square test Mann-Whitney U.

A model was used to identify the correlations between postoperative time point and clinical or metabolic parameters.

RESULTS

The data from the 16 patients was analyzed. There were 14 women and 2 men in the study group, mean age was 47.3 ± 12 years for women and 47.5 ± 13.4 years for men. With respect to co-morbidities, 12% of the patients had hypertension and dyslipidemia. Baseline BMI before the bariatric surgery was 41 ± 5.4 while pre-plastic surgery decreased to 27 ± 3.4 [Table 1]. The mean weight of tissue removed was 1638 ± 749 grams. Table 2 shows a comparison of the changes in the clinical and biochemical parameters of one day pre-operative, one day after surgery, and 3 months postoperative time points. Preoperative mean serum glucose, insulin, and leptin were 84.3 ± 10.7, 7.056 ± 2.6, and 15027 ± 7904, respectively. Postoperatively day 1, the mean serum glucose, insulin, and leptin were 106.5 ± 27.3, 19.42 ± 38.3, and 16307 ± 9542, respectively. Three months after surgery, mean concentration of serum glucose, insulin, and leptin were 83.3 ± 21.2, 7.38 ± 3.2, and 16912 ± 7843, respectively. Abdominoplasty produced mild incline in leptin levels after 3 months that was not statistically significant. There were no significant changes in the levels of insulin, glucose, low density lipoprotein (LDL), triglyceride, or hemoglobin levels.

Table 2. Clinical characteristics of the patients (n=16)

	BEFORE ABDOMINOPLASTY	DAY 1 AFTER ABDOMINOPLASTY	3 MONTHS AFTER ABDOMINOPLASTY
Leptin	15027 ± 7904	16307 ± 9542	16912 ± 7843
Insulin	7.056 ± 2.6	19.42 ± 38.3	7.38 ± 3.2
Glucose	84.3 ± 10.7	106.5 ± 27.3	83.3 ± 21.2
Triglyceride	97.6 ± 42.4	60.2 ± 15.9	113.4 ± 48.3
Low-density lipoprotein	111.3 ± 32.3	92.6 ± 27.8	111.9 ± 43.6
Hemoglobin	13 ± 1.3	11.6 ± 1.2	12.6 ± 1.6

All results are mean ± standard deviation

DISCUSSION

Our study demonstrated that abdominoplasty, even with massive fat removal, does not alter the metabolic profile of patients after bariatric surgery. An acute rise in insulin and leptin levels occurred approximately 24 hours after the operation but with no statistical importance. Levels of LDL, hemoglobin, and triglycerides demonstrated the opposite. We believe that this phenomenon was attributed to the stress perioperatively and not to metabolic modification. However, in a 3-month period after the surgery all measurements returned to baseline results.

While Martínez-Abundis et. al. [13] demonstrated a significant decrease in leptin concentration by abdominoplasty with no change in insulin resistance in the same group, our findings did not demonstrate any of these changes. Other reports on mammoplasty and liposuction have also demonstrated significant correlation between amount of fat reduction and decrease in leptin levels [15,16]. Rizzo and colleagues [17] showed that dermolipectomy is able to improve insulin sensitivity, lower the degree of inflammation, and decrease leptin levels. However, Klein, did not observe any effect of liposuction on insulin resistance after 10 weeks postoperatively [18]. Kelly et. al. [19] and Rizzo et. al. [17] suggested that the fact of patients not being in a "negative energy balance" may contribute to negating the effect of liposuction and dermolipectomy on insulin resistance and leptin levels. Our patients however, were not directed to keep negative energy balance particularly because they were on a post bariatric diet process already.

The lack of change may be attributed to the fact that at the time of post-bariatric operations, as most metabolic changes observed after bariatric surgery have already normalized.

Abdominoplasty is a surgical procedure and in volunteers studies the metabolic changes were similar to some of the metabolic changes observed after bariatric surgery. Our aim was to examine the metabolic changes in post bariatric patients and to understand if abdominoplasty, beyond the psychological and cosmetic results, has an additive metabolic effect that attenuates the reversion of metabolic changes after bariatric surgery [20]. Our study demonstrates that abdominoplasty in post bariatric patients is not associated with the metabolic changes of improved insulin resistance or lower leptin levels.

LIMITATIONS

The study has some limitation, particularly in the small sample size of only 16 patients which reduces the power of our results.

CONCLUSIONS

Our results emphasize the fact that metabolic changes are multi-factorial and not only correlated to surgical intervention. Abdominoplasty offers beneficial results for patients but probably does not interfere in satiety or other metabolic mediated changes.

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Capsule

Safety and feasibility of CRISPR-edited T cells in patients with refractory non-small-cell lung cancer

Clustered regularly interspaced short palindromic repeats (CRISPR)-Cas9 editing of immune checkpoint genes could improve the efficacy of T cell therapy, but the first necessary undertaking is to understand the safety and feasibility. **Lu** et al. reported results from a first-in-human phase I clinical trial of CRISPR–Cas9 *PD-1*-edited T cells in patients with advanced non-small-cell lung cancer (ClinicalTrials.gov NCT02793856). Primary endpoints were safety and feasibility, and the secondary endpoint was efficacy. The exploratory objectives included tracking of edited T cells. All prespecified endpoints were met. *PD-1*-edited T cells were manufactured ex vivo by cotransfection using electroporation of Cas9 and single guide RNA plasmids. A total of 22 patients were enrolled; 17 had sufficient edited T cells for infusion, and 12 were able to receive treatment. All treatment-related adverse events were grade 1/2. Edited T cells were detectable in peripheral blood after infusion. The median progression-free survival was 7.7 weeks (95% confidence interval 6.9–8.5 weeks) and median overall survival was 42.6 weeks (95% confidence interval 10.3–74.9 weeks). The median mutation frequency of off-target events was 0.05% (range 0–0.25%) at 18 candidate sites by next generation sequencing.

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Eitan Israeli

Capsule

Coronavirus in nonhuman primates

Rockx and co-authors conducted a comparative study of three human coronaviruses in cynomolgus macaques: severe acute respiratory syndrome-coronavirus (SARS-CoV) (2002), Middle East respiratory syndrome (MERS)–CoV (2012), and SARS-CoV-2 (2019), which causes COVID-19. The most recent coronavirus has a distinct tropism for the nasal mucosa but is also found in the intestinal tract. Although none of the older macaques showed the severe symptoms that humans do, the lung pathology observed was similar. Like humans, the animals shed virus for prolonged periods from their upper respiratory tracts, and like influenza but unlike the 2002 SARS-CoV, this shedding peaked early in infection. It is this cryptic virus shedding that makes case detection difficult and can jeopardize the effectiveness of isolation.

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In the cellars of the night, when the mind starts moving around old trunks of bad times, the pain of this and the shame of that, the memory of a small boldness is a hand to hold.

John Leonard (1939–2008), American literary, television, film, and cultural critic