Aesth Plast Surg
https://doi.org/10.1007/s00266-023-03775-4

Weight Loss After VASER-Assisted Liposuction

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Received: 21 July 2023 / Accepted: 22 November 2023

Abstract

Background Liposuction is one of the most common procedures used for body contouring. In this study, we aimed to determine whether there is a weight change with VASER-assisted liposuction (VAL) procedure and the demographic factors affecting it.

Methods A total of 51 patients (30 females and 21 males) who underwent VAL between the years of 2020 and 2022 were included in the study. Participants' weights before VAL, body mass indexes (BMI), aspiration volumes, demographic data, and weights and BMIs one month after VAL were recorded and analyzed. In addition, the fat ratio in the aspirate was determined in ten patients.

Results The mean aspiration volume with VAL was 4832.50 ± 2373.26 ml in females and 5176.90 ± 1602.61 ml in males. Body weights (baseline, 90.34 ± 9.17 vs. 71.01 ± 8.87; one month later, 86.95 ± 8.34 vs. 66.28 ± 10.04: $p < 0.001$) and BMIs (baseline, 28.59 ± 2.97 vs. 26.40 ± 3.69; one month later, 27.54 ± 2.92 vs. 24.59 ± 3.76: $p = 0.009$) were higher in males than females, both at baseline and after VAL. There was a significant decrease in body weights and BMIs after VAL in both females (4.73 ± 4.73 kg) and males (3.39 ± 4.27 kg) ($p < 0.001$). However, no correlation was observed between the decrease in body weights and BMIs after VAL and gender, age, aspirate volume, and fat volume.

Conclusion Although there was a decrease in mean body weight and mean BMI in both males and females one month after VAL, no associations were observed between weight drop after VAL and gender, age, aspiration volume, and fat volume.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these evidence-based medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords VASER-assisted liposuction · Male · Female · Weight drop · BMI

Introduction

In recent years, people, especially in Western society, have become very concerned with body shape, weight, and fat. People sought practical solutions to shape their fat deposits that are not suitable for lifestyle change. Liposuction is one of the most common cosmetic procedures performed worldwide because of its immediate and satisfactory results. According to the American Society of Plastic Surgery data, 235,237 liposuction procedures were performed in the USA in 2016. [1]. There have been a number of innovations in liposuction methods in order to get better results. These include power-assisted tumescent suction-assisted liposuction (SAL), ultrasound-assisted liposuction (UAL), laser-assisted liposuction (LAL), and vibration amplification of sound energy at resonance (VASER)-assisted liposuction (VAL) [2]. VAL is an ultrasound-assisted technology that selectively targets adipocytes. Thus, the complication rate is lower, as less damage is done to the surrounding tissues with its minimally invasive application [3].

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Published online: 26 December 2023

Liposuction is a body contouring procedure in which the body is shaped by removing subcutaneous fat from certain anatomical regions. Liposuction is not a weight loss procedure and should not be seen as a weight loss procedure [4]. However, there are data showing that there is a change in weight after liposuction, especially in studies that look at the metabolic effects of liposuction. In this study, our aim is to examine the changes in BMI and weight in individuals who underwent VAL and to describe the demographic data that affect this change.

Materials and Methods

Patients

A total of 51 patients who underwent VAL were included in this retrospective study. The study was carried out in a plastic surgery clinic between the years 2020–2022. This study was conducted in accordance with the tenets of the Declaration of Helsinki, and written informed consent was obtained from all subjects. The study excluded individuals who had undergone liposuction surgery in the past, those with a record of bleeding disorders, individuals taking blood thinning medication, those with a history of cancer, and those with a BMI of 35 or higher.

Surgical Procedure

All patients underwent VAL (VASER-Assisted Liposuction) procedure performed by the same surgeon under general anesthesia. During the surgical procedure, a tumescent solution was prepared by adding 1 mg of Adrenaline to every 1000 cc of Ringer's Lactate solution, and each patient received an appropriate amount of this solution. Then, using a VAL 5 ring 3.7 mm probe with 100% energy and C Mod, the procedure was performed for approximately 10 min per 1000 cc of infiltration, causing the fats to melt. Subsequently, liposuction was carried out using 4–5 mm mercedes cannulas. While patients who underwent VAL on the abdomen and waist region had drains inserted, those who had the procedure on the arm, leg, or back did not require drains. Following the operation, patients received maintenance fluid therapy, and a hospital follow-up was conducted on the day after the surgery.

The weights of the patients at the beginning of the study and after VAL were measured and evaluated. In addition, the fat ratio in the total aspirate taken after VAL was evaluated on a group of ten patients. For this, the net aspirates taken were kept in the collection container for one hour, and the separation of the liquid and fat components was ensured by the effect of gravity and density difference. Fat percentages were then recorded.

Statistical Analyses

Statistical analysis was performed using SPSS 20 statistical software. Kolmogorov-Smirnov test was used to evaluate the suitability of the measured data for normal distribution. Mean and standard deviation values of continuous variables, and n and percentage values of categorical variables were given. Student's t-test was used to compare demographic data by gender. Mixed ANOVA was performed to compare the weights of the patients before and after VAL by gender. Spearman correlation test was used to correlate the difference in weights before and after VAL with other data. A p-value of less than 0.05 was considered statistically significant.

Results

Demographic data of the patients included in the study are given in Table 1. The mean age of the patients, of which 30 were female and 21 were male, was 34.58 ± 6.97 years. Mean weight before VAL was 78.97 ± 13.10 kg, mean weight after was VAL 74.79 ± 13.85 kg, mean BMI before VAL was 27.30 ± 3.55 kg/m^2, mean BMI after VAL was 25.80 ± 3.71 kg/m^2, mean VAL duration was 75.10 ± 20.62 minutes, and mean aspirate volume with VAL was 4974.31 ± 2079.28 ml. The average weight at six months was 73.82 ± 14.23 kg. Participants experienced a mean weight drop from baseline of 5.15 ± 5.12 kg over the same period. VAL was applied to the abdomen in 37 patients, waist in 35 patients, arms in 26 patients, back in 19 patients, breast side in 15 patients, legs in 13 patients, thighs in 8 patients, knees in 5 patients, and lower neck in 4 patients.

Comparison of demographic data by gender is shown in Table 2. The mean weight of women before VAL was 71.01 ± 8.87 kg, and it was significantly lower than the mean weight of men before VAL, 90.34 ± 9.17 kg (t = − 7.546, $p < 0.001$). Similarly, the mean weight of women after VAL was 66.28 ± 10.04 kg, and it was significantly lower than the mean weight of men after VAL of 86.95 ± 8.34 kg (t = − 7.736, $p < 0.001$). The mean BMI before VAL of women was 26.40 ± 3.69 kg/m^2, and it was significantly lower than the mean BMI of men before VAL of 28.59 ± 2.97 kg/m^2 (t = − 2.250, $p = 0.029$). Similarly, the mean BMI value of women after VAL was 24.59 ± 3.76 kg/m^2, and it was significantly lower than the mean BMI after VAL of 27.54 ± 2.92 kg/m^2 for men (t = − 2.999, $p = 0.04$). At the postoperative six months, females exhibited a mean weight of 65.42 ± 10.34 kg, while males had a mean weight of 84.21 ± 9.36 kg, with a statistically significant difference (t = − 8.156, $p < 0.001$). Regarding weight drop from baseline, females

Table 1 Demographic data of the patients.

Variables	Mean ± S.D.
Age (year)	34.58 ± 6.97
Height (cm)	171.75 ± 9.02
Weight before liposuction (kg)	78.97 ± 13.10
Weight at one month (kg)	74.79 ± 13.85
Weight drop (kg)	4.18 ± 4.55
Weight at six month (kg)	73.82 ± 14.23
Weight drop from baseline (kg)	5.15 ± 5.12
VAL duration (minutes)	75.10 ± 20.62
Aspirated volume, (ml)	4974.31 ± 2079.28
Weight drop / Aspirate (kg/l)	1.04 ± 1.25
BMI before liposuction (kg/m^2)	27.30 ± 3.55
BMI at one month (kg/m^2)	25.80 ± 3.71
BMI drop (kg/m^2)	1.49 ± 1.65
	n (%)
Gender	
Female	30 (59.0%)
Male	21 (41.0%)
Anatomic Site	
Abdomen	37 (92.5%)
Back	19 (47.5%)
Waist	35 (87.5%)
Arm	26 (65.0%)
Thighs	8 (20.0%)
Knee	5 (12.5%)
Leg	13 (32.5%)
Breast side	15 (37.5%)
Lower neck	4 (10.0%)

BMI: Body Mass Index, VAL: VASER assisted liposuction.

experienced a mean decrease of 5.59 ± 5.22 kg, and males had a mean decrease of 6.13 ± 5.84 kg, with no statistically significant difference between the two groups (t = 1.406, p = 0.541).

There was no difference between the genders in terms of age, mean VAL duration, mean volume of aspirate taken with VAL, and weight drop.

According to mixed ANOVA, there was a significant difference between the mean weights of individuals before and after VAL (F(1, 49)= 39,318, p = 0.00001) (Table 3). There was a significant difference between the weights of women before and after VAL (F(1, 49)= 32,416, p = 0.00001). There was also a significant difference between men's weights before and after VAL (F(1, 49)= 11,642, p = 0.001). Similarly, there was a significant difference between male and female weights before VAL (F(1, 49)= 56.942, $p < 0.001$) and between male and female weights after VAL (F(1.49)= 59.847, $p < 0.001$). However, there was no significant interaction between weight drop before and after VAL and gender (F(1, 49)= 1.074, p = 0.305). The weight drop among women before and after VAL was 4.73 ± 4.73 kg and was 6.7% of their initial weight. The weight drop among men before and after VAL was 3.39 ± 4.27 kg and was 3.8% of their baseline weight. There was no difference between men and women in terms of weight drop (p = 0.305). Weight at six months and BMI at all time points also exhibited significant differences within each gender over time ($p < 0.001$). However, there were no significant gender-time interactions for weight (p = 0.418) and BMI (p = 0.184) at six months.

According to the mixed ANOVA performed, there was a significant difference between the BMIs of individuals before and after VAL (F(1, 49)= 37,922, p = 0.00001) (Table 3). There was a significant difference between the BMIs of women before and after VAL (F(1, 49)= 36,786, p = 0.00001). There was also a significant difference between men's BMI before and after VAL (F(1, 49)= 8.730, p = 0.005). Similarly, there was a significant difference between men's and women's BMIs before VAL (F(1.49)= 5.061, p = 0.029) and BMIs after VAL (F(1.49)= 8.995, p = 0.004). However, there was no significant interaction between BMI change before and after VAL and gender (F(1, 49)= 2.643, p = 0.110). The BMI difference among women before and after VAL was 1.80 ± 1.84, which was 6.81% of the baseline BMI. The difference in BMI among men before and after VAL was 1.05 ± 1.25 kg/m^2, which was 3.67% of the baseline BMI. There was no difference between men and women in terms of BMI changes (p = 0.110).

No correlation was observed between the weight drop in individuals after VAL and age, VAL duration, and the aspirated volume (Table 4).

The fat ratio in the aspirate taken separately from ten patients, nine of whom were female and one male, was calculated (Table 5). In these ten patients, the mean volume of aspirate taken with VAL was 5340.90 ± 1965.81 ml, and the mean volume of fat taken with VAL was 3956.36 ± 1597.41 ml. The volume of fat taken with VAL was 5.29 ± 2.06% of the weight before VAL. In these ten patients, the difference between weight before VAL and weight after VAL was 8.75 ± 4.54 kg. The weight drop at one month after VAL was 12.37 ± 6.87% of the baseline weight. Although the volume of fat taken with VAL was 5.29 ± 2.06% of the weight before VAL, the body weight drop in one month was approximately twice the volume of net fat removed (12.37 ± 6.87%). At the six-month post-liposuction, participants exhibited a mean weight of 65.38 ± 15.68 kg.

The Figs. 1 and 2 show the patients before and after the procedure.

Table 2 Comparison of data by gender.

	Female	Male	*p*
Age (year)	33.76 ± 8.27	35.76 ± 6.52	t = − 1.005, $p = 0.320$
Weight before liposuction (kg)	71.01 ± 8.87	90.34 ± 9.17	t = − 7.546 , $p < 0.001$
Weight at one month (kg)	66.28 ± 10.04	86.95 ± 8.34	t = − 7.736 , $p < 0.001$
Weight drop (kg)	4.73 ± 4.73	3.39 ± 4.27	t=1.036, $p = 0.305$
Weight at six month (kg)	65.42 ± 10.34	84.21 ± 9.36	t = − 8.156 , $p < 0.001$
Weight drop from baseline (kg)	5.59 ± 5.22	6.13 ± 5.84	t=1.406, $p = 0.541$
VAL duration (minutes)	73.74 ± 23.97	77.06 ± 14.95	t = − 0.562, $p = 0.577$
Aspirated volume, (ml)	4832.50 ± 2373.26	5176.90 ± 1602.61	t = − 0.578, $p = 0.566$
Weight drop / Aspirate volume (kg/l)	1.19 ± 1.03	0.82 ± 1.12	t=1.018, $p = 0.314$
BMI before liposuction (kg/m^2)	26.40 ± 3.69	28.59 ± 2.97	t = − 2.250, $p = 0.029$
BMI at one month (kg/m^2)	24.59 ± 3.76	27.54 ± 2.92	t = − 2.999, $p = 0.04$
BMI drop (kg/m^2)	1.80 ± 1.84	1.05 ± 1.25	t=1.626, $p = 0.110$

BMI: Body Mass Index, VAL: VASER assisted liposuction.

[t]Student's t-test

Table 3 Comparison of VAL and change in patient weights by gender.

	Female	Male	*p* value (Gender)	*p* value (Time)	*p* value (Interaction)
Weight before liposuction (kg)	71.01 ± 8.87	90.34 ± 9.17	$p < 0.001$	$p < 0.001$	$p = 0.305$
Weight at one month (kg)	66.28 ± 10.04	86.95 ± 8.34			
Weight at six month (kg)	65.42 ± 10.34	84.21 ± 9.36	$p < 0.001$	$p < 0.001$	$p = 0.418$
BMI before liposuction (kg/m^2)	26.40 ± 3.69	28.59 ± 2.97	$p = 0.009$	$p < 0.001$	$p = 0.110$
BMI at one month (kg/m^2)	24.59 ± 3.76	27.54 ± 2.92			
BMI at six month (kg/m^2)	24.14 ± 3.64	26.83 ± 3.18	$p < 0.001$	$p < 0.001$	$p = 0.184$

BMI: Body Mass Index, VAL: VASER-assisted liposuction

Mixed ANOVA test

Table 4 Correlation between weight change after VAL and other data.

	Weight drop (kg)	
	rho	*p*
Age	0.039	0.812
Aspirated volume (ml)	− 0.063	0.697
VAL duration (minutes)	− 0.073	0.606

[rho]Spearman correlation coefficient

Table 5 Data of ten patients whose fat volume in the aspirate was determined.

	Mean ± S.D.
Weight before liposuction (kg)	75.21 ± 14.71
Weight at one month (kg)	66.46 ± 17.21
Weight at six month (kg)	65.38 ± 15.68
Weight drop (kg)	8.75 ± 4.54
Aspirated volume, (ml)	5340.90 ± 1965.81
Fat volume (ml)	3956.36 ± 1597.41
Weight drop / Aspirate volume (kg/l)	2.03 ± 1.49
Weight drop / Fat volume (kg/l)	2.89 ± 2.35

Discussion

In this study, we examined the changes in BMI and weight in individuals who underwent VAL. As a result of VAL, a significant decrease was observed in the mean weight and BMI of both women and men. However, although the decrease in mean weight and BMI of women after VAL was numerically higher than that of men, it was not statistically significant.

Recent developments enable large volume liposuctions to be performed easily and safely. With large-volume

Figure 1 A 36 year-old male patient before and after the procedure.

liposuction, both subcutaneous adipose tissue and intra-abdominal adipose tissue are significantly removed. Thus,

Figure 2 A 29 year-old female patient before and after the procedure.

the body is shaped as desired and weight loss is achieved [5]. However, the data on weight change after liposuction are controversial. In studies conducted with experimental animals, the animals regained weight after liposuction [6–8]. In their study on humans, Rinomhota et al. [9] reported that the mean weight, which was 70.91 ± 8.89 kg at the beginning, increased to 75.20 ± 10.67 kg at the 18th month after liposuction. In the same study, they determined that the BMI, which was 26.87 ± 2.63 kg/m^2 at the beginning, increased to 28.53 ± 3.44 kg/m^2 at the 18th month after liposuction. In a review of 631 patients, 80% of individuals maintained their stable weight after liposuction [10]. However, information on weight change was not provided in that review. Robles-Cervantes et al. [11] observed no change in mean BMI one month after liposuction (25.3 ± 2 vs. 25.1 ± 2 kg/m^2).

There are studies reporting weight reduction in individuals after liposuction. Cardenas-Camarena et al. [12] documented that patients who underwent large-volume liposuction (mean, 8,700 ml) lost an average of 6 kg after 21 months. Lee et al. [13] observed a mean weight loss of 0.9 kg in patients 13 months after liposuction (mean, 1935

ml). In the study by Hernandez et al. [14] in women aged 18–50 years, weight loss after liposuction was determined as 2.1% at the sixth week, 1.45% at the sixth month, and 0.41% at the end of one year. In their study in which Geliebter et al. [15] applied liposuction to nine premenopausal healthy overweight/obese women (BMI = 29.9 ± 2.9 kg/m^2), they reported that the mean weight loss of the patients was 4.7 ± 2.8 kg at the end of the twelfth week. At the end of the twelfth week, they also observed significant decreases in BMI, body fat, and waist circumference compared to baseline. Gonzalez-Ortiz et al. [16] determined that mean BMI decreased from 31.7 ± 1.7 kg/m^2 to 30.4 ± 1.1 kg/m^2, and mean weight decreased from 77.5 ± 7.4 kg to 74.3 ± 7.7 kg at 21–28 days after liposuction. Hong et al. [5] reported that the patient mean weight decreased from 64.5 ± 18.8 to 59.9 ± 17.8 kg and the mean BMI decreased from 23.8 ± 4.4 to 22.0 ± 4.2 kg/m^2 in their study in which they obtained an average of 6,790 ml of aspirate by liposuction. They determined that the weight reduction per aspirate performed with liposuction was 0.67 ± 0.10 kg/l. The differences between the results of the studies are probably due to the difference in the volume of aspirate taken by liposuction and the follow-up times after liposuction.

In our study, the mean body weight and BMI of the men included in the study were higher than the women, both at baseline and after VAL. In the first month after VAL, significant reductions in body weights and BMIs of both men and women were detected compared to baseline values. A 6.6% decrease in female body weight and a 3.75% decrease in male body weight were determined. There was no difference between the genders in terms of reduction in mean body weight and mean BMIs. In addition, there was no significant relationship between weight drop after VAL and age, duration of VAL, and the volume of aspirate. Although the patients did not follow any diet program for a month after VAL, the decrease in body weight and BMI also reveals the slimming effect of liposuction, which is actually a body contouring method. In our study, the fat ratio in the aspirated supernatant was also determined in ten patients. Although the volume of fat taken with VAL was 5.29 ± 2.06 % of baseline weight, the body weight drop in one month was approximately twice the volume of fat taken (12.37 ± 6.87%). The reason for the greater reduction in body weight in this ten-person group is that nine of the participants were women, and the average volume of aspirate was 5340.90 ± 1965.81 ml. There are also studies showing that liposuction, which was only seen as an aesthetic procedure in the past, has a therapeutic value as well [16]. The fact that the body weight drop after VAL was approximately twice the volume of aspirated fat in our study confirms these recommendations regarding liposuction.

According to recent scientific statement from the American Heart Association, even modest amounts of weight loss in short term is sufficient to improve both metabolic syndrome and associated systemic inflammation and endothelial dysfunction [17]. Furthermore, data revealed that weight loss in obese patients leads to significant reductions (ranging from 9% to 32%) in epicardial fat thickness, a well-established indicator of increased cardiovascular risk [18]. While weight loss achieved via liposuction may offer advantages in addressing weight-related health factors, a more comprehensive understanding necessitates further investigation and a detailed assessment of patient-related factors and clinical and laboratory findings.

Most of the previous studies evaluated the effects of liposuction only in women. The strength of our study is that it was evaluated in men as well as women. Our study has several limitations to declare. Firstly, the follow-up period is relatively short. Despite this, we successfully collected updated weight and BMI data from all study participants at designated control time-points. Secondly, from a statistical standpoint, linear regression would have been a more robust test for assessing factors influencing weight loss, but its application was restricted by our sample size. Nonetheless, the data presented in this study offers valuable insights into the impact of liposuction on weight loss, a context that is not extensively explored in existing literature.

In conclusion, our study revealed consistent reductions in both mean body weight and mean BMI among both men and during the initial and sixth months following VAL. This implies that the achieved weight loss was sustained within the first year post-procedure. However, no significant correlations were identified between the extent of weight loss after VAL and variables such as gender, age, aspirate volume, and fat volume. It is crucial to consider the impact of the weight drop effect associated with liposuction in the context of these findings.

Disclaimer

The views and opinions expressed in our article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

Funding No financial support was received from any institution or person in our study.

Data availability Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest to declare.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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