



Evaluation of patient satisfaction following the grafting of autologous fat tissue obtained by VASER-assisted liposuction

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Abstract

Aim: Autologous fat transplantation, also known as fat grafting or fat injection, is an increasingly popular technique in reconstructive surgery with minimal complications and low morbidity rates. The aim of this study is to evaluate the satisfaction of patients after the injection of autologous adipose tissue obtained by the Vibration Amplification of Sound Energy at Resonance (VASER)-assisted lipoplasty method due to aesthetic concerns or deformity.

Materials and Methods: The study includes 20 patients who underwent VASER-liposuction-guided autologous fat injection between 2014 and 2021 in a single center. Patients were invited for follow-up approximately three years after the surgical intervention, and patient satisfaction and complications were evaluated with a semi-structured questionnaire.

Results: Patient and surgeon satisfaction received the highest score at discharge. Sensory changes and tissue stiffening were found to be the most common complications. Overall satisfaction and scar healing were identified as the parameters with the highest score.

Conclusion: VASER-assisted liposuction and autologous fat transplantation is a technique associated with high patient satisfaction and minimal complications. The method is an ideal technique for whole body contouring and facial operations.



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Introduction

Autologous fat transplantation, also known as fat grafting or fat injection, is an increasingly popular technique in reconstructive surgery of the breast, hip and chest [1,2]. Autologous fat graft (AFG) had been used for over a century to reshape the body contours and repair structural defects. However, in 1987 Bircoll et al. developed a novel method by combining liposuction with fat collection and autologous transplantation of the collected fat [2]. The combination of liposuction and AFG enabled the removal of large amounts of undesirable fat tissue from different parts of the body by creating small incision points through small aspiration cannulas. The biggest advantage of this technique is the presence of relatively unlimited, soft and easily malleable donor tissue [3]. Hence, the stem cells, adipocytes, fibroblasts, smooth muscle cells, endothelial cells and preadipocytes in the adipose tissue content improve the skin quality and repair the present damage. As a result of all these properties, AFG is preferred more than other conventional temporary filling materials [2,4].

AFG technique is frequently used to eliminate soft tissue atrophy, acne scars, wrinkles, traumatic scars, or body contour irregularities after surgical interventions [5].

Although AFG can be applied any location in the body, it is often applied to the nasolabial lines on the face, around the mouth, periorbital and glabellar regions, extremities, gluteal regions, and the breast area [5]. Although AFG has minimal complications and low morbidity rates compared to other reconstructive techniques, some complications are observed after surgical intervention, including ecchymosis, bruising, infection, swelling, hematoma, nodule, abscess, allergic reactions, paresthesia, and contour abnormalities or irregularities [6]. Serious complications such as permanent unilateral blindness, stroke, and tissue necrosis may occur due to fat embolism, particularly after fat injections to the face area [7]. Another disadvantage of this method is the resorption, melting or displacement of the transplanted fat. Thus, these conditions, which may also affect patient satisfaction might cause repetition of surgical procedures, and increase the risk of complications and procedure cost [8].

Vibration Amplification of Sound Energy at Resonance (VASER®) is an ultrasound-assisted technology that tar-

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gets mainly the adipocytes, and emulsify the adipose tissue prior to the suction. The best-known property of VASER® technology is its liposelective features, without damage to surrounding tissues and vessels [9]. Hence, the studies report lower complication and higher graft survival rates with the VASER® technology [10, 11].

The general evaluation of patient satisfaction is a necessary indicator to reveal the quality of the treatment or the surgical intervention given to the patient [12]. In this study, we aimed to evaluate the patient satisfaction and the complications after the injection of autologous fat tissue obtained by the VASER® assisted lipoplasty method due to aesthetic concerns or deformity.

Materials and Methods

A power analysis was conducted using a two-tailed test, a an alpha of 0.05 showed that a total sample of 18 participants was required to achieve a power of 0.80. Twenty patients over the age of 18 who had undergone autologous fat injection with VASER-assisted liposuction due to aesthetic concerns were included in our study. Ethical approval was obtained from the institutional review board, and informed consent was obtained from all participants. Women who were pregnant or lactating, those who received any immunomodulatory or immunosuppressive therapy in the last four weeks, and patients who refused to participate in the study were excluded. Liposuction was performed in accordance with the procedures recommended by Coleman [13]. The donor sites were determined as periumbilical region, abdomen, back, waist lateral, anterior and medial thighs and hips. Under general anesthesia, tumescent solution containing lactate ringer (1000 cc), adrenaline (1 mg) and 2% lidocaine hydrochloride was used for the donor area. Fat aspiration was performed using 3.70 mm cannulas. The collected fat was centrifuged in 10 cc tubes at 1300 rpm for 3 minutes. After centrifugation, the supernatant and the sediment were discarded and the middle fraction was collected for injection. Cannulas with a diameter of 1.20 mm and 2 mm were used for the injection to the desired areas.

Following the surgery, the patients were not required to adhere to specific dietary restrictions. However, they were advised to maintain a protein-rich diet during the initial 3-4 weeks post-procedure.

While the patients were discharged, post-operative pain, ecchymosis development, as well as patient and surgeon satisfaction were evaluated.

The early complications (seroma, burn at entry site, distant burn) were evaluated in the immediate postoperative period. Patients were invited for follow-up controls after the surgical intervention on the postoperative month 6, and patient satisfaction and late complications (sensory change, tissue hardening, necrosis, cellulite, hyperpigmentation, prolonged edema, excess skin, stretch marks, tissue fibrosis) were evaluated.

In addition to complications, the presence of excess skin, skin quality, tissue structure and ptosis were evaluated clinically by the operating surgeon.

The questions and the structure of the questionnaire evaluating patient satisfaction are shown in Figure 1. The

Name : _____ Date of Surgery : _____
 Surname : _____ Date of Questionnaire : _____
 Tel : _____

Please Check the Appropriate Box

GENERAL SATISFACTION
 Not satisfied Very satisfied
 1-) 2-) 3-) 4-) 5-) 6-) 7-) 8-) 9-) 10-)

SCAR MARK HEALING
 Bad Excellent
 1-) 2-) 3-) 4-) 5-) 6-) 7-) 8-) 9-) 10-)

CHANGE OF BODY SHAPE
 Bad Improved
 1-) 2-) 3-) 4-) 5-) 6-) 7-) 8-) 9-) 10-)

SELF-CONFIDENCE
 No change Improved
 1-) 2-) 3-) 4-) 5-) 6-) 7-) 8-) 9-) 10-)

OTHER COMMENTS

Figure 1. Satisfaction questionnaire applied to patients after autologous fat graft transfer.

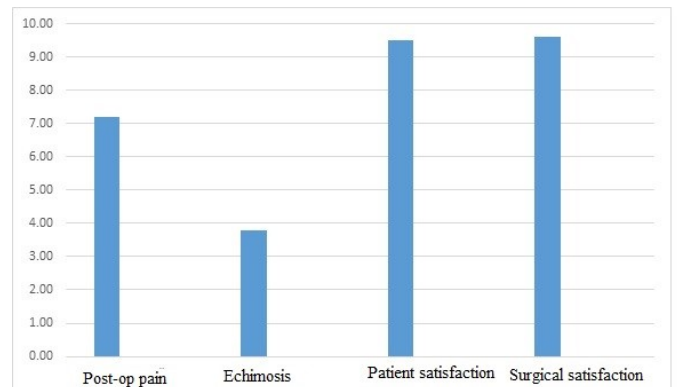


Figure 2. The satisfaction ratios in terms of post-operative pain, ecchymosis development, patient and surgeon satisfaction at discharge.

patients were asked to rate their satisfaction in the questionnaire from 0 to 10 in the most appropriate way for their situation.

Ethical approval was received from Istanbul Atlas University Non-invasive Clinical Research Ethics Committee (22.05.2023-27247).

Statistical analysis

Descriptive statistics, normality study (Kolmogorov–Smirnov) and comparative statistics (Dependent t-test) were made using Excel 2013 (Microsoft, WA, USA) and SPSS18 -Windows (IBM, New York, USA) programs. The significance value for statistical analyses were determined as <0.05.

Results

The demographic data of the 20 patients who participated in our study, the number of aspirated areas, the duration and the amount of aspirated fat, the number of injection sites and the amount of fat are shown in Table 1. The areas where fat was injected are shown in Table 2.

The mean follow-up was 38.20 ± 29.10 months after the operation.

Post-operative pain, ecchymosis development, patient and surgical satisfaction evaluations at the time of discharge are summarized in Figure 2.

Patient and surgeon satisfaction on discharge received the highest score.

The weight and body mass index (BMI) of the patients before and after the second control were compared in detail in Table 3. According to the measurements taken, post-operative weight and BMI values significantly decreased following the operation.

Complications and clinical evaluations observed according to the evaluation performed at an average of are summarized in Table 4. While sensory changes and tissue hardening were found to be the most common complications, distant burn, port burn, necrosis and cellulitis were not observed in any of the patients. Overall satisfaction and scar healing were identified as the parameters with the highest score (Table 5).

None of the patients reported any defects, irregularities, or alterations in shape at the donor and recipient sites of the fat grafts.

Table 1. Demographic data of patients, number of aspirated areas, aspiration time, amount of fat aspirated, number of injection sites and amount of injected fat.

	Mean \pm SD	Range
Age	34.95 \pm 9.09	20-46
Gender (F/M)	11/9	
Number of aspiration location	5.65 \pm 3.24	2-14
Duration of the aspiration (min)	67.32 \pm 25.83	10-123
Amount of aspirated fat (ml)	4.272 \pm 1.983.80	400-8450
Number of injection locations	3.87 \pm 2.39	1-10
Amount of injected fat (ml)	937.43 \pm 540.24	0.90-1.802

Table 2. Regions of fat graft injection.

Region	Percentage (%)
Breast and chest	27
Hip	24
Shoulder	16
Upper arm	8
Nasolabial	8
Cheek	5
Glabella	3
Browline	3
Under eye	3
Chin	3

Discussion

While AFG has become a part of clinical practice for aesthetic breast augmentation and facial filling, the evidence regarding its efficacy, complications, and patient satisfaction is still inadequate [14,15]. In our study, we aimed to examine patient satisfaction and complications after AFG with VASER-assisted liposuction.

Although various methods such as silicone implants, collagen or hyaluronidase fillers have been used in soft tissue augmentation over the years, none of them have the "ideal" properties of autologous fat such as biocompatibility and easy applicability. On the other hand, the most common disadvantages of this method are the migration of the injected adipose tissue to another location and the shorter duration of use [16].

In their study, Shiffman et al. reported that the technique for fat removal had a high effect on the ratio of living fat cells. In their histological examinations, they reported that the rate of viable fat cells after transplantation could reach up to 100%, and pre-operative massage application would cause a 20% decrease in the viable cell rate [17]. Although they did not mention the follow-up period and patient satisfaction in their study, overall patient satisfaction was found to be high at an average of 38 months after the operation, similar to our study.

Murillo et al. conducted a satisfaction questionnaire on 123 patients who had undergone fat injection to the hip region with an average follow-up period of 24 months, and observed that, 91% of the patients reported that their self-confidence increased, their clothing sizes were smaller than before, and they received positive comments from their close circles [18]. In their study in which they investigated the effect of AFG on wound healing, Bhooshan et al. declared that 76.50% of the participants reported that they were satisfied with the aesthetic results of the operation. They reported the satisfaction rate as 92.60%, especially in cases where the scar age is less than 5-years old [19].

While the findings of our study are remarkably consistent with other AFG-related clinical studies in terms of patient satisfaction, there are few studies on how long the transferred fat will last at the injection site. Ahmad et al. reported that the transplanted fat would stabilize in the tissue within 3-4 months and could persist for up to 8-12 years. They also reported that 35.25% of the transplanted fat were reabsorbed on the third, and 54.72% on the sixth month after injection. In the same study, they reported that patient satisfaction decreased six months after the operation, and a second application of AFG was needed [20].

In their in vitro investigation study, focusing on the impact of VASER-assisted procedures on cell viability, Duscher et al. utilized specific cell surface markers to evaluate cell differentiation and survival. They reported a higher osteogenic and adipogenic marker expression on the adipose grafts obtained with VASER technology, as well as an enhanced soft tissue healing and neo-vascularization [11]. Furthermore, a comparative analysis between fat grafts acquired from sub-jects who underwent traditional suction-assisted liposuction and VASER liposuction demonstrated increased angiogenesis, reduced fibrosis, and enhanced

Table 3. Weight and body mass indexes of patients after VASER-assisted liposuction and autologous fat grafting.

	Preoperative					Postoperative					p
	Mean	SD	Min	Max	Median	Mean	SD	Min	Max	Median	
Weight (kg)	72.36	12.33	56	94	70	67.73	10.60	52	85	65.50	0.0001
BMI (kg/m ²)	24.11	3.35	17.99	28.73	24.24	22.57	2.82	17.99	26.82	21.91	0.0001

Table 4. Complications observed after VASER-assisted liposuction and autologous fat grafting.

Complication	Number of Cases (n/%)
Seroma	7 / 35%
Sensory change	10 / 50%
Tissue hardening	10 / 50%
Burn at entry site	-
Distant burn	-
Necrosis	-
Cellulite	-
Hyperpigmentation	3 / 15%
Prolonged edema	1 / 5%
Excess skin	5 / 20%
Stretch marks	2 / 10%
Ptosis	-
Tissue Fibrosis	3 / 15%

Table 5. Patient satisfaction scores according to survey after VASER-assisted liposuction and autologous fat grafting.

Parameters	Mean	SD	Min	Max
General satisfaction	9.05	2.01	1	10
Scar mark healing	8.45	2.32	1	10
Change of body shape	8.10	3.21	1	10
Self-confidence	7.85	3.16	1	10

cell differentiation capacity in the VASER group. Additionally, the VASER group exhibited lower levels of inflammation, apoptosis, and scar formation [10]. Based on these observations, we propose that the favorable outcomes observed in our patient cohort may be attributed to the application of a VASER-assisted protocol for obtaining adipose tissue grafts.

Moak et al. reported that the volume preservation after AFG applied to the breast area ranged from 52.4% to 62.4% and the majority of this reduction was due to the loss of fat tissue. They reported that other variables such as the amount of initially injected fat, various infiltration routes, collection or processing techniques, breast volume, and patient weight gain over time, edema, and follow-up time should also be considered when calculating the lifetime of the injected fat [21]. In our study, although the ratio of absorbed fat to body mass was not measured, it was observed that the general satisfaction rate of the patients was high even after a long period of follow-up.

Groen et al. reported that as a result of their meta-analysis

including 23 studies with a minimum follow-up period of 12 months, 92% of patient satisfaction and 89% of surgeon satisfaction were reported after AFG on the breast area. In the same study, 17 studies with a mean follow-up period of 34.5 months were followed and the complication rate was 17%, with the most common complication being palpable indurations (33%) [22]. In our study, although serious complications were not observed, the rate of at least one complication was 85%. Similar to the study of Groen et al., sensory changes (50%) and tissue hardening (50%) were found to be the most common complications. Although we did not detect tissue and fat necrosis in our study, meta-analysis by Groen et al. reported that necrosis was observed in 14% of cases with mammography, 5.70% with sonography, and 7.70% with MRI.

In their study, Li et al. reported that ptosis can be observed in AFG applications to the eye area, due to the trauma during the procedure and the increased mechanical load on the eyelids from the fat graft. They also reported that the force applied with a sharp-tipped cannula during injection may damage the structures under the eyelid and puncture the capillaries [23]. In our study, however, ptosis was not encountered as a complication after injections into the eye area.

Examining 1000 patients who underwent AFG for intraoperative and postoperative complications, Maione et al. did not observe very serious complications such as pulmonary embolism, sepsis, deep vein thrombosis, stroke, and mortality, but observed local fibrosis in 83 patients [24]. Similarly, we did not encounter any major complications in our study group.

There are studies reporting statistically significant changes in BMI, weight, insulin resistance, and lipid metabolism after liposuction [25,26]. In our study, we observed that the overall weight and BMI of our patients significantly decreased after liposuction, which was performed with an average aspiration volume of 4272 ml.

Limitations

The limitations of our study are the lack of a control group, inclusion of more than one injection site, and lack of a validated questionnaire in native language of the patients to assess patient satisfaction. It has been reported that the success of a procedure in aesthetic surgery is directly proportional to the patient's satisfaction with his physical appearance, and that evaluations including appearance and satisfaction should be made with reliable and validated tools [27]. Since our study included both facial and chest injections, we could not use a location-specific questionnaire to assess patient satisfaction. Despite a low number of study participants, all patients were eligible to

fulfill the inclusion criteria and voluntarily filled the survey form within the defined amount of time period. It should be noted that, VASER-assisted liposuction is a relatively novel and a high-end technology, and the number of patients, who can afford the procedure for their operation is limited. However, our study data contributes the limited number of studies reporting outcomes following a VASER-assisted fat grafting procedure.

Conclusion

In conclusion, VASER- assisted liposuction with AFG is an ideal technique for body contour adjustments and facial area aesthetic operations since high patient satisfaction is accompanied by minimal complications and an improved BMI. However, it is beneficial to repeat the study by focusing on one body region and in the presence of a control group and larger number of patients.

Ethical approval

Ethical approval was received for this study from Istanbul Atlas University Non-Interventional Clinical Research Ethics Committee (22.05.2023-27247).

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