

Determinants of Patient Satisfaction With Ultrasound-Assisted Liposuction

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Abstract

Background: Liposuction is one of the most common aesthetic procedures and a number of options are available to practitioners in terms of surgical technique. One of those options is ultrasound-assisted liposuction (UAL), which has garnered considerable attention in the literature and from patients themselves. Because the role of ultrasound in body sculpting is continuing to increase over time, the authors believe that a comprehensive assessment of patient satisfaction after the procedure is essential. Currently, there are very few reports in the literature examining patient satisfaction with UAL, and to the authors' knowledge, no reports in the literature have successfully outlined the determinants and predictors of long-term satisfaction with the procedure.

Objective: The authors examine the correlates and predictors of patient satisfaction after UAL.

Methods: The authors conducted a prospective cross-sectional study on 609 consecutive patients who underwent UAL from 2002 to 2008. One hundred and sixty (54%) out of 300 patients with whom the authors could make contact agreed to answer a standardized questionnaire regarding their overall satisfaction.

Results: Nearly 80% of the patients were completely or mostly satisfied with UAL. Seventy-five percent reported that they had or would recommend UAL to others. Women ($P = .009$), patients who did not gain weight after their UAL procedure ($P < .001$), patients who were content with their body appearance ($P < .001$), patients whose dress sizes decreased after UAL ($P = .001$), and patients with confidence in their body ($P < .001$) showed statistically significant higher rates of satisfaction with UAL. Among these correlates, confidence in body (odds ratio [OR] = 24.4; 95% confidence interval [CI]: 6.8–83.3) and contentment with body appearance (OR = 5.5; 95% CI: 1.5–19.4) were found to be reliable independent predictors of patient satisfaction.

Conclusion: Most patients were satisfied with UAL, but certain patient responses were more highly correlated with overall satisfaction than others and therefore can be considered predictors of long-term patient satisfaction with this procedure. The results of this study may provide plastic surgeons with valuable clues that can enhance preoperative planning and therefore enable further improvement of patients' satisfaction with UAL.

Keywords

ultrasound-assisted liposuction, patient satisfaction, determinant

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Liposuction, an increasingly popular technique in the field of aesthetic surgery,¹ is the most common cosmetic operation in the United States.² The technique of tumescent liposuction is quite prominent, in part because of its purported safety.^{3–5} In the past decade, ultrasound-assisted liposuction (UAL) has been introduced as a modification of the original tumescent liposuction technique, providing lower complication rates and improved outcomes in the first reported investigations.⁶ The UAL technique was developed in Europe and South America; its introduction into the mainstream US surgery in 1997 was received with great enthusiasm.⁷ Today, although we know that UAL can be carried out with a high level of patient satisfaction,⁸ many of the published investigations have reported on

UAL only with regard to its current outcome and complication rates.^{8–10} Few reports have directly quantified the rate of patient satisfaction with UAL.¹¹ Moreover, we found no report evaluating the correlates and predictors of satisfaction with this procedure. This inquiry was performed to evaluate the satisfaction of patients undergoing UAL and its determinants.

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Table 1. Sociodemographic Characteristics of Patients (N = 609)

| | |
|-----------------------|-----------------|
| Sex, n (%) | |
| Men | 40 (6.5) |
| Women | 569 (93.5) |
| Age, y, n (%) | |
| 20-30 | 23 (3.8) |
| 31-40 | 116 (19.1) |
| 41-50 | 224 (36.8) |
| 51-60 | 199 (32.7) |
| > 60 | 46 (7.6) |
| Mean \pm SD | 47.6 \pm 9.3 |
| Range | 21-67 |
| Marital status, n (%) | |
| Single | 166 (27.2) |
| Married | 443 (72.8) |
| Occupation, n (%) | |
| Homemaker | 275 (45.2) |
| Student | 63 (10.4) |
| Governmental employee | 132 (21.6) |
| Private employee | 48 (7.9) |
| Health care worker | 40 (6.5) |
| Self-employed | 28 (4.7) |
| Retired | 18 (2.9) |
| Unemployed | 5 (0.8) |
| Education, n (%) | |
| Elementary school | 11 (1.8) |
| Advanced school | 188 (30.8) |
| University | 410 (67.4) |
| Height, cm | |
| Mean \pm SD | 163.3 \pm 7.2 |
| Range | 149-197 |
| Weight, kg | |
| Mean \pm SD | 75.2 \pm 15.2 |
| Range | 48-130 |
| BMI | |
| Mean \pm SD | 27.8 \pm 4.9 |
| Range | 19.3-47.7 |

BMI, body mass index; SD, standard deviation.

METHODS

Of 609 consecutive patients who underwent UAL during a six-year period beginning in January 2002 (for a total of 660 operations), 300 were available and were contacted for inclusion in this prospective cross-sectional study. Of the patients contacted, 160 (54%) agreed to answer a standardized questionnaire. The nature of the UAL procedure had been explained to the patients and the purported benefits, risks, and potential complications were reviewed. Medical malpractice insurance and special UAL consent had been obtained from all patients prior to surgery. Patient sociodemographic features and general data (including age, gender, educational level, occupation, and marital status) and clinical data (such as body mass index [BMI] and liposuction site) were gleaned from patient records (Table 1).

To evaluate patient satisfaction, an 22-item questionnaire from a previous study¹¹ was administered. The

questionnaire consisted of general information about the area(s) of liposuction, lifestyle habits, and satisfaction. All of the questions were multiple choice. The questionnaire was divided into four general areas: (1) time elapsed since liposuction and areas liposuctioned, (2) weight gain and fat return, (3) lifestyle habits, and (4) satisfaction and appearance. To evaluate the treatment effect on patient self-esteem and self-confidence, we included two previously-published questions¹²: "Is your emotional well-being better since receiving liposuction?" and "Do you have more confidence in your appearance since receiving liposuction?"

SPSS 13.5 (SPSS, Inc, an IBM Company, Chicago, Illinois) was used for statistical analysis. Quantitative data were expressed as mean \pm SE. Data were analyzed by independent *t*-test and Pearson chi-square testing for continuous and categorical variables, respectively. We calculated the binary logistical regression to determine the principal independent factors in patient satisfaction with UAL and their willingness to recommend UAL to others. For all tests, a *P* value < .05 was considered significant.

Surgical Technique

The patients were marked in a pattern that identified the areas to be treated with UAL; in essence, circles with an X were placed over prominences. Areas with asymmetries, dimpling, or indentations were also marked. Standard photography was performed preoperatively (after marking) and postoperatively. All cases were performed with preoperative uniform subcutaneous infiltration of the wetting solution in the intermediate surgical plane through a standard subcutaneous infiltration pump and cannula. The amount of infiltrate delivered was recorded in each case. The infiltrate was delivered with the superwet technique in a 1:2 ratio of infiltrate to estimated aspirate.^{13,14} The infiltrated solution included 1 liter of room temperature Ringer's containing 25 mL of 2% xylocaine, 2 mL epinephrine in a concentration of 1:1000, and 8 mL bicarbonate 8.2 mEq/L. The operative equipment consisted of an ultrasound generator (Sonoca-Lipo, Söring, Germany) at about 25 kHz and a 4.5-mm hollow titanium cannula (Liposuction-handpiece 240).

The access site incisions were carefully placed to conceal scars, also keeping in mind that each site should provide access to multiple treatment areas without causing the cannula to be bent or torqued. After the incision was made, a plastic trocar was inserted and a large cover mat was placed to prevent thermal injury from the cannula. The cannula was inserted into the skin protector (trocar) and treatment was commenced. The cannula was in motion at all times to prevent heat buildup and thermal injury. The UAL energy was discontinued in an area about 1 to 2 cm from the access site, to prevent repetitive over-treatment at this site and potential fat necrosis.

Aspiration was performed at 70% of the usual vacuum rate and a 3.5-mm standard fine surgical suction cannula (suction cannula, SIEVE) was employed for evacuation

Table 2. Correlation of Ultrasound-Assisted Liposuction (UAL) Body Site With Patient Satisfaction and Likelihood to Recommend the Procedure to Others

| Site of UAL | Percentage of Patients | Postoperative Satisfaction, % | Recommending UAL, % | P Value |
|-------------|------------------------|-------------------------------|---------------------|---------|
| Abdomen | 52 | 75 | 72 | < .001 |
| LE | 40 | 88 | 83 | < .001 |
| Buttock | 5 | 56 | 78 | 1.00 |
| Back | 5 | 78 | 78 | .028 |
| UE | 3.1 | 60 | 100 | — |
| Breast | 2.5 | 50 | 50 | .333 |
| Total | | 80 | 75 | < .001 |

LE, lower extremities; UE, upper extremities.

and final contouring of the treatment area. Any remaining asymmetries, deformities, or bulges were treated at that time. After final contouring, manual digital massage of the treated areas was performed. A pinch test (performed by holding the skin and fat between the surgeon's thumb and fingers) helped determine the amount of fat, its mobility, and the degree to which the enlarged area was due to a localized superficial fat deposit. Access incisions were then closed with a single 5-0 chromic suture if the incisions were wide enough to allow egress of fluid during the first 24 to 48 hours; dressings and compression garments were also applied. Two sets of compression garments were given to the patient. The first set was changed the day after the operation, and the patient was instructed to wear the second set continuously for one month and during days only for two months thereafter.

RESULTS

UAL Logistics

Most responders (62%) had undergone their UAL procedure six months to two years prior to the questionnaire. Only 15% and 23% answered the questions at less than six months and more than two years, respectively, from the time of their surgery. The majority of patients (92%) did not have a history of liposuction; for the remaining 8%, one to three previous liposuction procedures had been recorded. Most operations involved the abdomen (including flanks, 52%), followed by the lower extremities (40%; Table 2).

Sociodemographic and Clinical Data

Our UAL patients were predominantly women (94%). About 73% of the patients were married. Their ages ranged from 21 to 67 years (mean 47.6 ± 9.3). Many patients were homemakers (45%) or governmental employees (21%). The majority of patients held a university degree (67%); many also held an a high school diploma (30%). Patients had a mean height of 163.3 ± 7.2

cm and mean weight of 75.2 ± 15.2 kg. The mean BMI was 27.8 ± 4.9 (range, 19.3-47.7). The sociodemographic and clinical characteristics of patients who participated in the survey are presented in Table 1.

Lifestyle and Weight Changes

Seventy percent of the responders had no change in their exercise regime after UAL, whereas 25% reported exercising more and 5% exercised less. Questions about eating habits showed that 27% of the patients began a new dietary regimen, whereas most (68%) did not change their eating habits, and only 5% decided to discontinue their previous dietary regimen. The survey also revealed that 85% of the responders reported no change in their appetite after UAL, whereas 9% and 6% increased and decreased desire for food, respectively.

We found that 35% of all respondents gained weight after UAL. The majority of these patients (55%) gained less than 2.5 kg, 20% gained between 2.5 and 5 kg, 13.6% gained between 5 and 7.5 kg, and 11.4% gained more than 7.5 kg. In 65% of the patients who reported no weight gain, 35% reported weight loss and 65% reported no change in their weight. Among those who reported weight loss, 36% lost less than 2.5 kg, 38% lost between 2.5 and 5 kg, 10% lost between 5 and 7.5 kg, and the remaining 16% lost more than 7.5 kg. The survey also showed that nearly 58% of those who gained weight did so after three months, whereas 86% of reported weight losses happened in the first three months after surgery. Changes in weight were not found to be associated with changes in exercise regime ($P = .158$).

Treatment Effects on Body Concept and Size

Nearly 75% of patients were content with their body appearance after UAL (12% excellent, 32% very good, and 30% good). Nineteen percent of patients thought their appearance was fair, and only 7% responded that their appearance was poor. The majority of our patients (72%) reported a reduction in their dress size; 71% of those reported a decrease of less than two sizes. The average decrease was 2.4 ± 1.5 sizes. Nineteen percent experienced no change in their clothing size after surgery, and only 9% reported an increase in their dress size. Fifty-eight percent of those patients reported an increase of less than two sizes (average, 2.4 ± 1.5 sizes).

Mental and Social Effects

Productivity improved in 21% of patients after UAL; 71% reported no change, and 7% reported a decrease in productivity. Patient self-assessment postoperative health revealed that 15% thought their postoperative health had improved, whereas 74% and 11% reported no change or a

Table 3. Correlates and Independent Variables of Postoperative Satisfaction and Likelihood to Recommend Ultrasound-Assisted Liposuction (UAL)

| Associates | P Value | Binary Logistic Regression | |
|-----------------------------------|---------|----------------------------|---------|
| | | OR (95% CI) | P Value |
| Postoperative satisfaction | | | |
| Gender | .009 | 0.7 (0.1-5.1) | NS |
| Weight gain | < .001 | 2.4 (0.7-8.1) | NS |
| Change in dress sizes | .001 | 1.8 (0.5-6.5) | NS |
| Contentment with body appearance | < .001 | 5.5 (1.5-19.4) | .008 |
| Confidence in body | < .001 | 24.4 (6.8-83.3) | < .001 |
| Recommending UAL | | | |
| Gender | .013 | 1.1 (0.2-6.1) | NS |
| Weight gain | .021 | 1.4 (0.5-4.2) | NS |
| Satisfaction with liposuction | < .001 | 13.7 (3.2-58.8) | < .001 |
| Contentment with body appearance | < .001 | 3.4 (1.1-10.1) | .029 |
| Confidence in body | < .001 | 1.0 (0.2-4.5) | NS |

NS, not significant; OR, odds ratio; CI, confidence interval.

downturn in their health, respectively. However, 75% of respondents reported that their emotional well-being was better after the procedure and the same percentage reported that the treatment had improved their body confidence.

Satisfaction With and Willingness to Recommend UAL

In this evaluation, almost 80% of the patients were completely or mostly satisfied with UAL (37% very satisfied, 42% satisfied, 15% unsatisfied, and 6% very unsatisfied), and nearly 75% of them would recommend the treatment to their friends or family members. We found that 90% of satisfied responders would recommend UAL to others, whereas only 25% of unsatisfied respondents were willing to do so ($P < .001$; Table 2).

Patient educational level, marital status, BMI, weight, and age did not have significant associations with satisfaction or willingness to recommend UAL to others ($P > .05$). Women were significantly more satisfied with the procedure than male patients ($P < .05$). Patients who did not gain weight after UAL ($P < .001$), who were content with their body appearance ($P < .001$), whose dress sizes decreased after the procedure ($P = .001$), or who reported increased confidence in their body were also more satisfied with their surgery ($P < .001$). We also found that female patients had significantly more enthusiasm for recommending UAL to others (78% females vs. 37% males). Patients who were satisfied with the procedure, who were content with their appearance, who did not gain weight, and who felt confident with their body were also significantly more likely to recommend UAL to others ($P < .05$). Binary logistic regression was performed to identify the independent variables that correlated with satisfaction with UAL and willingness to recommend the procedure to others; the resultant calculations can be seen in Table 3.

DISCUSSION

We found that UAL was most frequently sought by women, married individuals, people with higher educational degrees, and those who had higher than recommended BMI. We also found that more than three fourths of the respondents were content with their surgery. The same percentage of respondents were happy with their body appearance, reported improvement in their emotional well-being, reported that they would recommend UAL to others, and reported a decrease in their dress size. Our analysis also demonstrated that contentment and confidence with body appearance were independent predictors of satisfaction with UAL. Contentment with body appearance and satisfaction with UAL were also independent predictors of a patient's likelihood to recommend UAL to others; patients who were unsatisfied and were less likely to refer patients were those who had the lowest opinion about their outcomes.

In terms of long-term satisfaction after UAL in body contouring, the patient is responsible for three key elements: exercise, a proper diet, and positive lifestyle changes.¹⁵ Any patient with enough resources to select UAL for his or her cosmetic surgery presumably is aware of the significance of lifestyle modification. Nonetheless, our study showed that nearly 70% of patients did not change their exercise regime, nor did they initiate a healthier postoperative diet. The same findings have been reported after UAL in Texas, although the sociodemographic characteristics of those patients were unfortunately not reported.¹¹ On the basis of these findings, we believe that plastic surgeons should most strongly discuss the importance of postoperative lifestyle changes with their UAL patients, regardless of social, economic, and educational status.

Our data also showed that most weight loss occurred in the first three postoperative months, and most patients who gained weight did so more than three months after UAL.

This implies that advice regarding lifestyle modification does not have a lasting impact; therefore, we recommend that discussions about these changes should be reinforced during each patient follow-up visit. Although UAL is an effective treatment modality that can provide good cosmetic results and a high level of patient satisfaction after surgery,⁸ patients should be encouraged to be proactive in maintaining these results through a healthy exercise and diet regimen for optimal long-term satisfaction.

The data on satisfaction with treatment indicate that a high proportion of patients (80%) were satisfied after UAL. Our findings in this regard were comparable with some previous evaluations on satisfaction of patients with different types of liposuction, including UAL. Broughton et al¹¹ reported that 44% of their patients were “very satisfied” and 36% were “satisfied” with liposuction. In Hanke et al’s study,¹⁶ a survey was completed by tumescent liposuction patients six months postoperatively; of the 59% of patients who responded to their survey, 84% had high levels of overall satisfaction. Comparable results were reported in Goyen’s survey (n = 123),¹⁷ in which 83.7% of patients “felt happier about their shape when looking in the mirror” after tumescent liposuction. Similarly, in our assessment, 75% of the respondents were content with their body appearance after surgery and stated that their new appearance had positive effects on their self-esteem, social life, and their profession as well. In a study conducted by Smeets et al,¹⁸ similar effects on patient self-esteem were noted, in that reduction of fat and BMI values led to an overall improvement in health-related quality of life.

Seventy-five percent of the patients in our evaluation reported that they would recommend UAL to their family or friends. In a study from Rohrich et al,¹⁹ a similar rate was reported. They found that 74% to 90% of their patients reported that they would recommend UAL to others, in correspondence with changes in their weight after the procedure. These same authors also reported, as we did, that UAL did not improve patients’ self-perceived productivity and health. Minuscule differences in the rate of satisfaction of our patients and their contentment with body appearance versus previous studies^{12,20} can be attributed to demographic differences, including the higher BMI of our study group. In terms of predictive factors, a similar patient survey conducted by Hensel et al²¹ revealed that symptom improvement (97% of their patients) and satisfaction (86%) with surgery have a direct relationship to a patient’s likelihood to recommend the procedure to a friend (86%).

Interestingly, we found that there was a significant association between our respondents’ satisfaction and their willingness to recommend UAL to their family or friends. We believe the knowledge of certain demographic variables and their correlation with long-term patient satisfaction has practical clinical implications for the plastic surgeons, in that they will be able to better select ideal candidates for the UAL procedure and be able to preoperatively counsel their patients more effectively. Although our analysis showed that a number of factors influenced overall patient satisfaction, among the variables, patients’ contentment with their body appearance and their body confidence after UAL were more statistically significant

than their gender, changes in weight, or dress sizes in independently predicting patients’ satisfaction. This evaluation also showed that patients’ satisfaction with the procedure was more important than their gender, postoperative weight gain, contentment with physical appearance, and/or body confidence in predicting their likelihood to recommend the procedure to others.

Similar results were obtained in a study by Roustaei et al²² evaluating potential complications and their influence on patient satisfaction. That study revealed that body region, age, gender, and BMI were less significantly correlated with complications following UAL and therefore less significantly correlated with patient satisfaction. We found that respondents who were content with the appearance of their body after UAL were 5.5 times more satisfied with UAL, as compared to those who were not content with their body appearance. Those who had confidence in their body were also almost 25 times more satisfied, as compared to patients who were not confident in their body after surgery. We also found that patients who were satisfied with the procedure were 14 times more likely to recommend UAL than those who were not satisfied; patients’ contentment with their appearance increased their willingness to recommend UAL by 3.4 times. In fact, despite mild postoperative pain (albeit less than other traditional methods and with a lower duration of analgesic use)²³ and some cases of fat return and weight gain, patients are willing to recommend this technique to others because of the advantages of UAL over other liposuction techniques (such as tumescent liposuction and traditional or suction-assisted liposuction).

During this study, we found that patients tended to experience a certain amount of amnesia related to their preoperative appearance, so we revised our protocol to conduct a similar study at three months follow-up for all future patients, when the comparison would be fresher in their minds.

CONCLUSIONS

Our assessment underscores the importance of preoperative counseling and postoperative reinforcement regarding the importance of lifestyle changes for UAL patients. The correlates and independent variables of patient satisfaction (such as gender, body image, postoperative weight gain, and body confidence) and their willingness to recommend this procedure to others provide plastic surgeons with some important information that can influence their clinical practice with regard to patient selection and patient counseling prior to UAL.

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