



Body Contouring

Power-Assisted Gluteal Augmentation: A New Technique for Sculpting, Harvesting, and Transferring Fat

Aesthetic Surgery Journal
2015, 1–8
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DOI: 10.1093/asj/sjv161
www.aestheticsurgeryjournal.com
OXFORD
UNIVERSITY PRESS

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Abstract

Background: A simple and reproducible surgical technique for gluteal shaping and augmentation with autologous fat is needed.

Objectives: The authors describe a novel approach to large-volume gluteal augmentation that combines power-assisted liposculpting and fat harvesting of the zones around the buttock with autologous fat transfer.

Methods: One hundred ten patients who underwent gluteal augmentation were evaluated in a prospective study. Liposculpting and fat harvesting were performed with power-assisted liposuction. Fat then was transferred to the gluteal region with simultaneous power-assisted vibration and tunnelization. A questionnaire to assess patient satisfaction was administered at 6 months postoperatively.

Results: The mean body mass index of the patients was 30 kg/m² (range, 26–36 kg/m²). Liposuction volumes ranged from 1400 to 5000 mL, and injection volumes ranged from 300 to 900 mL per side for each session. Operating times ranged from 60 to 120 minutes. Patients were monitored for an average of 20 months (range 12–48 months). Complications included a burning sensation in 5 of 110 patients (4.5%), persistent swelling in the lower back in 3 patients (2.7%), and a mild infection in 1 patient (0.9%).

Conclusions: Power-assisted gluteal augmentation with autologous fat is an efficient, safe, and reproducible procedure that produces an aesthetically pleasing gluteal projection and contour.

Level of Evidence: 4



Accepted for publication July 20, 2015.

Fat harvesting and autologous fat transfer have become popular surgical techniques during the past 15 years.^{1–5} Liposuction with autologous fat grafting to the buttocks for the purposes of contouring and gluteal augmentation was popularized by Mendieta.^{3,6} Compared with placement of gluteal implants, autologous fat transfer allows for greater versatility and precision and a more rapid recovery with fewer complications.^{3,6,7}

Mendieta^{3,6} found that a large volume of donor fat is needed to achieve a pleasing gluteal shape. Depending on the body size and gluteal dimensions of the patient, injection volumes range from 450 to 1100 mL per side.^{3,6} Large-volume fat transfer by traditional fat harvesting and injection¹ is associated with long operating times and surgeon fatigue. To avoid these challenges, the authors developed a novel technique for gluteal contouring and augmentation that involves

power-assisted liposculpting, fat harvesting, and fat transfer. By marking the patient preoperatively with a triangular pattern to identify donor sites for fat transfer, the operating time can be reduced while ensuring a pleasant contour around the buttock. In the present study, the authors describe the indications, surgical approach, and outcomes of power-assisted liposculpting and augmentation of the gluteal region.

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METHODS

Patients and Study Design

From January 2009 to March 2013, 110 patients who underwent power-assisted gluteal augmentation were evaluated in a prospective study. Approval from an institutional review board or ethics committee was not obtained because all patients underwent surgical procedures in a private practice, however the study was conducted in accordance with the Declaration of Helsinki principles. Patients who were healthy and presented with mild to moderate excess fat in the sacral, posterior, and lateral flank areas were included in the study. Patients who were active smokers were excluded from the study and did not undergo the procedure. Patients were supplied with detailed information regarding the surgical procedure, and all patients provided written informed consent. The medical charts of all patients were reviewed, and preoperative photographs were obtained.

Surgical Procedures and Postoperative Care

Fat harvesting and fat transfer areas were marked preoperatively with the patient standing. The liposculpting and fat

harvesting area was indicated as a triangular pattern from the midpoint of the axilla superiorly to just above the superior intergluteal fold posteriorly and the inguinal crease anteriorly (Figure 1). The base of the triangle corresponded to a curved line running parallel to the iliac crest and delineating the superior border of the buttock. In some patients, the inner thighs and lateral legs were marked for liposculpting and also served for additional zones for fat harvesting. Zones for fat transfer were based on the presence of depressions and contour deformities and were marked preoperatively to provide shape, contour, and volume to the buttock. Because the lateral buttock is deficient in muscle and usually presents as a depression, it was marked for fat transfer in most patients to produce enhanced gluteal volume and projection.

Following the administration of general anesthesia, the patient was placed in the prone position for liposuction of the sacrum, lower back, posterior and lateral flanks, and posterior inner thighs. This position enabled definition of the buttock contour. To preserve the shape of the upper buttock, liposuction did not proceed below the iliac crest. Tissues were infiltrated with Klein's solution and fat was harvested and prepared for transfer with a power-assisted system (Lipomatic

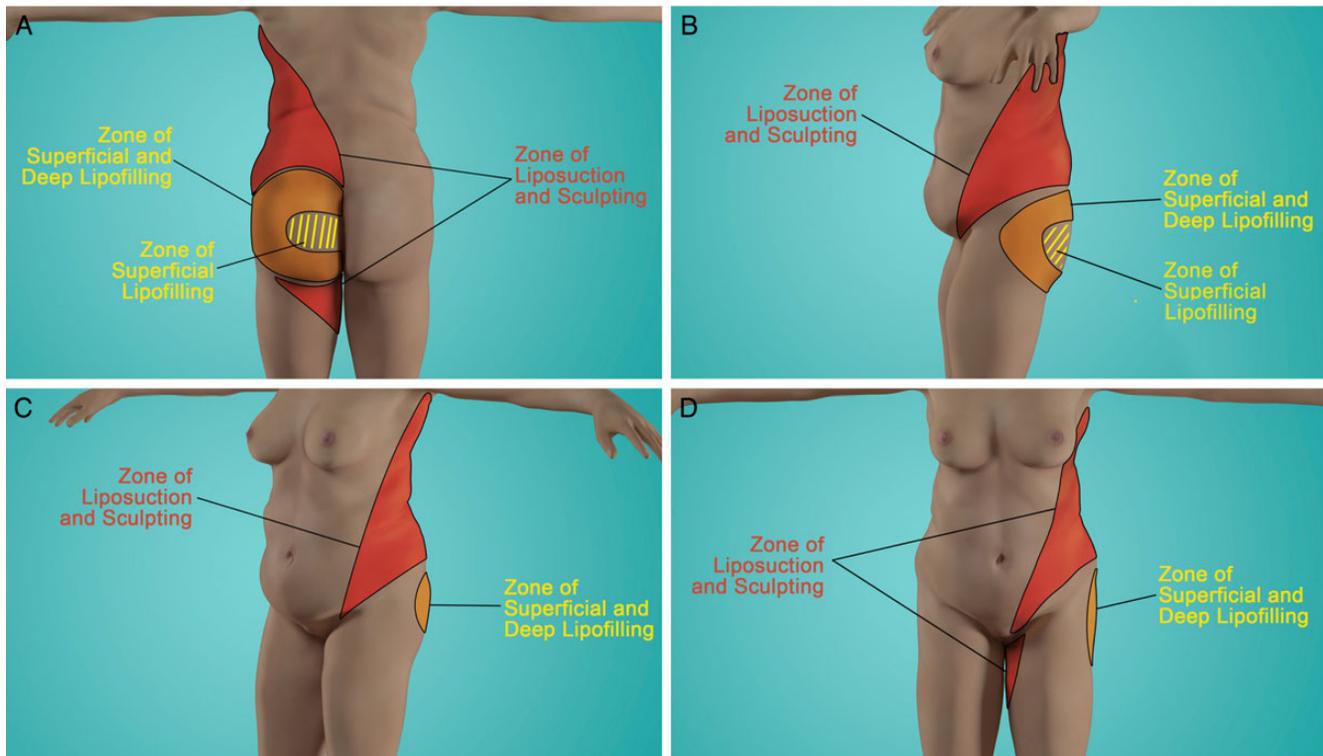


Figure 1. (A) Rear, (B) lateral, (C) oblique, and (D) frontal views indicating zones of power-assisted liposuction and augmentation of the gluteal region. Images were generated with Maya 3D animation software (Autodesk, Inc., Mill Valley, CA), Photoshop (Adobe Systems, San Jose, CA), and Zbrush (Pixologic, Los Angeles, CA). Red shading denotes the triangular pattern of liposuction and sculpting around the buttock, lateral abdomen, and inner thigh. Orange shading and yellow lines denote the zones of gluteal fat injection. The orange shading indicates the region of fat injection into the superficial and deep subcutaneous layers, whereas the yellow lines indicate the area of fat injection into the superficial layer only.

Eva SP, Euromi SA, Verviers, Belgium). Fat was harvested through several access incisions by means of a 3-mm multiple-hole cannula attached to a handpiece and set to 3000 bars and 0.7 atm. Access incisions were as follows: 1 in the posterior superior iliac spine, 1 or 2 in the posterior flank, 1 on each side of the midlateral back, 1 in each lower gluteal crease, 1 in the superior umbilicus, 1 on each side of the lower abdomen, 1 on each side of the inguinal crease, 1 on each side of the lateral thighs, 1 on each side of the lateral flank, and 1 on each side of the midlateral abdomen.

The lipoaspirate was placed on an abdominal pad, and gentle pressure was applied to transfer blood and crystalloids through the pad quickly without destroying fat cells. The remaining solution of adipose tissue was collected into sterile 60-mL syringes. Two surgical teams performed these steps to shorten the duration that harvested fat was maintained outside the body and to decrease the operating time. Specifically, the surgeon performed liposuction of the buttock and fat harvesting while the assistant prepared the fat for transfer. A video that demonstrates these preoperative markings and surgical procedures in a 36-year-old woman may be viewed at www.aestheticsurgeryjournal.com.

A matrix for fat grafting was prepared at the recipient site by multidirectional and multilayered subcutaneous tunneling with the Lipomatic Eva SP system through several access incisions. With the handpiece disconnected from the suction system, fat was injected through a custom-made 3-hole cannula (V-shaped base; 3 hole diameter, 3 mm) that enabled simultaneous vibration of the recipient site (Figure 2). Injections were made along preoperative markings at access incisions along the superior intergluteal fold, the infragluteal fold, and the lateral borders of the buttock to maximize fill volume and correct contour deformities. The upper, lateral, and lower zones of the buttock typically required fat injections in the superficial and deep subcutaneous

planes to achieve sufficient volume (Figure 1). In contrast, injection into the superficial plane was sufficient to correct contour and volume concerns in the medial zone of the buttock.

The patient subsequently was moved from the prone to the supine position for sculpting and fat harvesting along preoperative markings on the thighs, the medial abdomen, and the lateral abdomen along the external obliques and inguinal creases. Liposuction with the patient supine enabled definition of the abdominal midline, the obliques, and the anterior inner and lateral thighs. In some cases, the patient was turned from supine to a slightly lateral position, and fat was injected along preoperative markings of the lateral aspects of the buttocks. During the operation, all pressure points were padded, and pneumatic stockings were connected. A compressive garment was applied before the patient recovered from anesthesia, and the patient was instructed to wear the garment for 6 weeks. Patients also were instructed to avoid sitting, except for toileting, for 2 weeks postoperatively and to avoid direct pressure on the buttocks for 4 weeks.

Assessment of Patient Satisfaction

At 6 months postoperatively, patients were asked to complete a non-anonymous questionnaire prepared by the authors to assess their satisfaction with the surgical outcome and their pre- and postoperative care and to determine their psychological and physical well-being. A blank copy of the questionnaire can be viewed at www.aestheticsurgeryjournal.com.

RESULTS

A total of 110 patients (8 men and 102 women) underwent power-assisted liposuction and autologous fat transfer in the

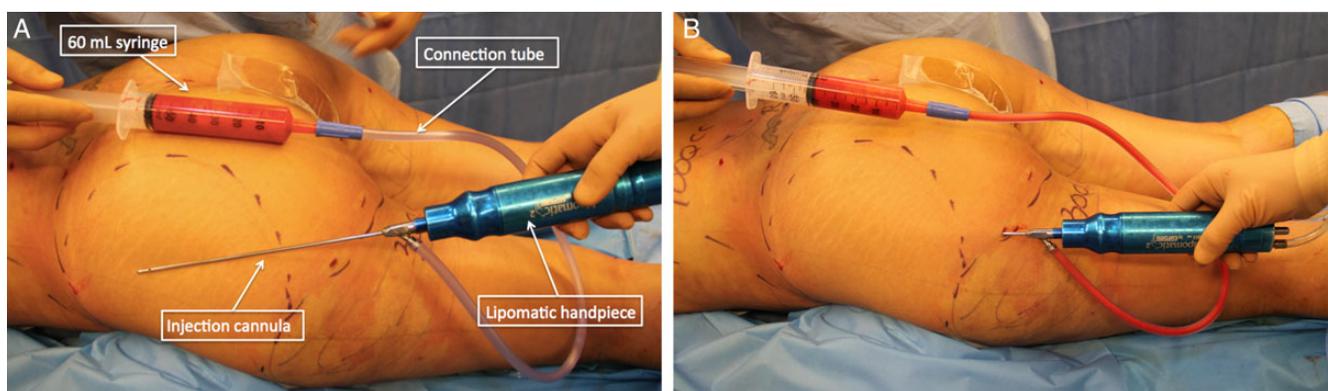


Figure 2. Intraoperative views of this 32-year-old woman depicting the assembly of the power-assisted device for fat injection into the gluteal region. (A) A tube is connected to the tip of a 60-mL syringe and to the base of the V-shaped cannula. The cannula, in turn, is connected to the Lipomatic handpiece, and suction is disabled. (B) The surgeon positions the Lipomatic handpiece, with vibration enabled, in the recipient site. Simultaneously, the assistant expels autologous fat from the syringe through the connection tube into the cannula.



Figure 3. (A, C, E) This 36-year-old woman presented for power-assisted liposuction and gluteal augmentation. She underwent liposuction of 3600 mL from the back, flanks, and thighs and 1100 mL from the abdomen. Subsequently, 480 mL of autologous fat was transferred to each buttock. (B, D, F) One year postoperatively. Intraoperative views depict this patient in the prone position (G) at the start of the operation and (H) after liposuction and fat injection.

gluteal region. The mean age of the patients was 34 years (range, 21-55 years), and the mean body mass index was 30 kg/m² (range, 26-36 kg/m²). The mean liposuction volume was 2500 mL (range, 1400-5000 mL), and the mean fat injection volume was 550 mL per side for a single session (range, 300-900 mL). The mean operating time was 90 minutes (range, 60-120 minutes), and an average of 1.2 surgical sessions (range, 1-2 sessions) were required to achieve the desired outcome. Patients received follow-up for an average of 20 months (range, 12-48 months). Patients were discharged on the day of the operation or 1 day postoperatively. Patients returned to sedentary activities at 5 days postoperatively and resumed normal activities at 4 weeks (Figures 3-5).

Five of 110 patients (4.5%) experienced an intermittent burning sensation in the flank. This sensation was attributed to aggressive liposuction in this area and resolved spontaneously in all patients by 6 months postoperatively. Three patients (2.7%) experienced swelling of the sacral area and lower back and were advised to undergo kinesiotherapy. At 6 months postoperatively, swelling had resolved in these patients. One patient (0.9%) had mild erythema of the buttock on day 10 after undergoing injections of 600 mL of fat on each side. There was no evidence of other systemic signs of infection or purulence from the recipient site. The patient was prescribed oral antibiotic therapy, and the erythema resolved spontaneously at 16 days postoperatively. No patients in this study developed seromas or hematomas postoperatively, and there were no major complications (eg, fat embolism) at the donor or recipient sites. Of 110 patients, 95 (86.4%) completed a questionnaire to assess satisfaction at 6 months postoperatively. Eleven patients (10%) declined to complete the questionnaire, and 4 patients (3.6%) declined when the questionnaire was administered at 6 months postoperatively. Of 95 respondents, 84 (88.4%) indicated that they would repeat the surgical procedure or recommend it to a friend, 82 (86.3%) were satisfied with the final gluteal shape, and 80 (84.2%) reported improved psychological well-being as a result of the operation (Figure 6).

DISCUSSION

Autologous fat grafting to the buttocks has become popular during the past decade because it is versatile and associated with a lower complication rate than gluteal implantation.⁷ Risks inherent to implantation, including rotation, capsular contracture, seroma, extrusion, and displacement, are avoided with autologous fat transfer.⁶ Mendieta³ described the posterior region in terms of 10 aesthetic units; of these, 6 units were essential for defining the frame and shape of the buttocks. Gluteal implants can provide localized projection but cannot equal the versatility of fat transfer to address every volume-deficient aesthetic unit.

The estimation of how much fat to harvest from the zones around the buttocks remains nonscientific and typically is



Figure 4. (A, C, E) This 29-year-old woman underwent power-assisted liposuction (2300 mL from the back, flanks, and thighs; 1000 mL from the abdomen) and gluteal augmentation (650 mL per buttock). (B, D, F) Three years postoperatively.

based on a surgeon's experience and intuition and a pinch test administered with the index finger and thumb.³ Gluteal augmentation requires the transfer of large volumes of fat ranging from 450 to 1100 mL per side, depending on the body size and gluteal dimensions of the patient.³ Traditional techniques for harvesting and injection of large volumes of

fat require long operating times and are associated with surgeon fatigue and morbidities in the patient, such as unintentional hypothermia necessitating aggressive rewarming. Although power-assisted liposuction is a well-known technique, the harvesting and transfer of large volumes of fat with power-assisted technology is less common. This study is the first to describe the preparation of a tissue matrix at the recipient site by means of power-assisted vibration and tunnelization. This technique enhances tissue competency for large-volume fat grafting without compromising the safety of the procedure or significantly increasing the operating time.

The surgical procedures described in this study are safe and efficient. We developed a set of preoperative markings (Figure 1) that simplify and expedite the identification of zones for liposuction and sculpting of the gluteal region. The surgical procedure we describe combines augmentation with autologous fat in the same session as fat harvesting and liposculpting and employs the Lipomatic Eva SP system. The operating time was further reduced by the authors' unique and extensive experience with the Lipomatic Eva SP system, allowing liposuction, sculpting, tunnelization of the recipient site, and fat transfer to proceed swiftly. In addition, some surgical procedures were performed in parallel to decrease the operating time. Specifically, the surgeon sculpted the buttocks and harvested fat while the assistant simultaneously prepared the autologous fat for transfer.

Power-assisted gluteal augmentation is suitable for patients who present with mild to moderate excess fat and flat buttocks. Although no single method for fat harvesting or processing is regarded as superior,^{5,8} harvesting from the flanks and thighs improves the body contour while helping to shape the buttock. Gluteal augmentation involves a synergistic approach of removing fat from areas of excess surrounding the buttocks and transferring it to volume-deficient areas to achieve an aesthetically pleasing result.³ The final frame of the buttocks is dependent on sculpting the posterior zones, the lateral flanks, the waist line, and around the buttock. Even if a portion of the injected fat is resorbed over time, meticulous sculpting of these surrounding zones offers long-term aesthetic changes to the gluteal shape.

Mojallal et al⁹ evaluated the cell yields of the stromal vascular fractions from adipose tissue samples collected with various harvesting techniques. These authors determined that non-power- and power-assisted liposuction techniques were associated with greater cell yields than aspiration with a syringe and that power-assisted liposuction produced better results than non-power-assisted liposuction. In a study of the viability of adipose-derived stem cells (ASCs) isolated from fat harvested with power-assisted liposuction vs manual aspiration, Keck et al¹⁰ demonstrated that power-assisted liposuction collects viable ASCs and is a valid tool for fat harvesting. Moreover, cells harvested with power-assisted liposuction expressed significantly higher levels of differentiation markers than cells harvested with manual aspiration, suggesting that

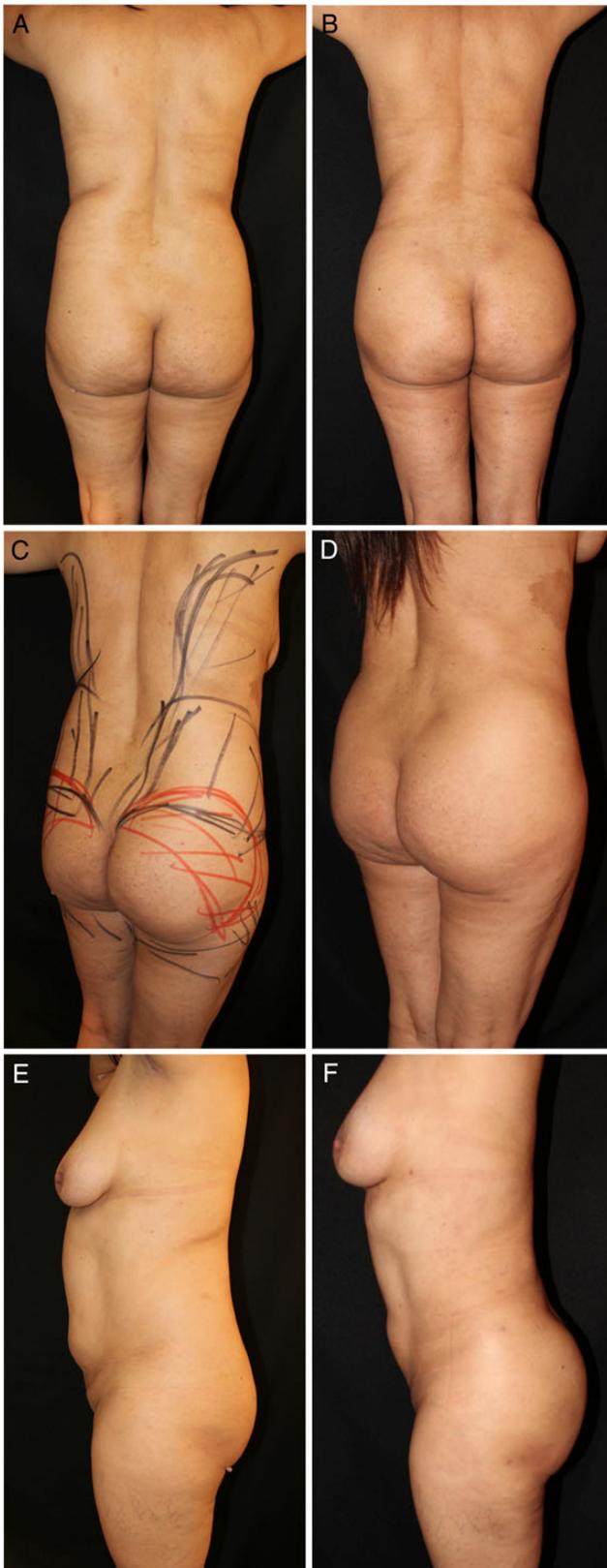


Figure 5. (A, C, E) This 42-year-old woman underwent power-assisted liposuction (2200 mL from the back, flanks, and thighs; 1200 mL from the abdomen) and gluteal augmentation (550 mL per buttock). (B, D, F) One year postoperatively.

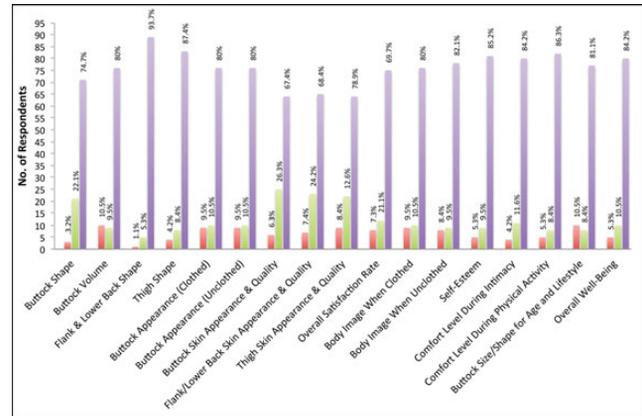


Figure 6. Results of the patient satisfaction questionnaire, which was administered at 6 months postoperatively and was completed by 95 of 110 patients (86.4%) in this study. Eighty-four of 95 (88.4%) respondents indicated that they would repeat the operation or recommend it to a friend. Blue bars indicate responses of “very dissatisfied/not good,” red bars indicate responses of “somewhat dissatisfied/not good,” green bars indicate responses of “somewhat dissatisfied/good,” and purple bars indicate responses of “very satisfied/good.” A dissatisfied rating comprised responses of “very/somewhat dissatisfied” and “not good/somewhat good.” Satisfied ratings comprised responses of “very satisfied/somewhat satisfied” and “somewhat good/very good.”

fat transferred from the products of power-assisted liposuction could develop into mature adipocytes more rapidly.¹⁰

We performed power-assisted liposculpting, tunnelization, and fat grafting with a 3-mm cannula. Erdim et al¹¹ found that liposuction with larger cannulae produces more viable fat grafts than liposuction with smaller cannulae. Moreover, the 3-mm cannula allows for precise shaping around the buttocks and is unlikely to create contour irregularities in these areas. With the Lipomatic Eva SP system employed in this study, the suction pressure and frequency of vibration can be controlled. We applied a suction pressure of 0.7 atm; this magnitude is safe and does not diminish the viability of the fat graft.¹²

Instead of centrifugation, we advocate sedimentation or straining of harvested fat to avoid compacting the lipoaspirate and to encourage its diffusion into the recipient site. Lipoaspirate processed by sedimentation or straining yields more dilute fat with an increased resorption rate; therefore, the volume of injected fat must be increased to account for the volume lost to resorption. Injection of diluted fat with simultaneous tissue vibration increases the grafting capacity of the recipient site by expanding the subcutaneous space, dispersing fat, and preventing the coalescence of fat lobules.¹³ Fat grafts become vascularized on approximately day 7 after transplantation.¹⁴ This is sufficient time for fluid in the dilute lipoaspirate to be absorbed so that it does not interfere with contact between the graft and recipient site.

Moreover, the transfer of diluted fat protects against high compartmental pressures following fat injection because fluid resorption decreases the pressures that might otherwise hinder survival of the fat lobules.

Contacts between the fat grafts and the recipient sites were maximized in this study by creating multiple access points for tunnelization and injection and by multiplanar delivery of fat. These maneuvers encourage revascularization and improve survival of the fat grafts.^{2,15-17} Our surgical approach includes power-assisted tunnelization¹³ in a multidirectional and multilayered fashion to prepare a matrix at the recipient site. The matrix ensures maximal space for fat grafting and limits the size of the injected fat lobules. Tissue vibration combined with the rapid back and forth motions of the cannula attached to a power-assisted handpiece create tunnels and optimize the filling capacity of the recipient site. This allows for expulsion of fat from a syringe under low pressure and avoids damage to the fat cells without compromising speed and precision of fat injection.

Limitations

This study had several limitations. The administration of a validated satisfaction survey would have added power to our assessment of patient satisfaction, but no standardized questionnaire assessing satisfaction with buttock reshaping was available. Instead, we prepared a non-anonymous questionnaire with questions adapted from the BREAST-Q. Standardized tools such as magnetic resonance imaging or 3-dimensional (3D) photography would have improved our assessment of surgical and aesthetic outcomes. In a previous study, we performed 3D imaging of patients who underwent replacement of breast implants with autologous fat to validate the quality of fat harvested and transferred with the Lipomatic Eva SP system.¹³ We were confident that this procedure could be adapted from breast enhancement to gluteal enhancement because of the large space capacity of the buttock. The effects of tunnelization and vibration described in this study are based on the authors' observations. A controlled clinical trial is needed to determine the precise benefits of these procedures.

CONCLUSIONS

Optimal gluteal augmentation by autologous fat transfer depends on a balance between liposuction, sculpting, and the injection of large volumes of fat to create an aesthetically pleasing projection and contour. The incorporation of the Lipomatic Eva SP system maintains safety of this procedure while enabling the surgeon to perform gluteal augmentation in a reasonable operating time and with excellent aesthetic outcomes.

Supplementary Material

This article contains supplementary material located online at www.aestheticsurgeryjournal.com.

Acknowledgement

The authors thank Mr Emilio Kheir for creating the illustrations presented in this article.

Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Funding

The authors received no financial support for the research, authorship, and publication of this article.

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