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Brachioplasty by Power-Assisted Liposuction and Fat Transfer: A Novel Approach That Obviates Skin Excision

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Abstract

Background: Current brachioplasty techniques include excisional surgery alone or in combination with liposuction. These techniques are associated with poor outcomes, such as residual contour deformities and unfavorable scarring.

Objectives: The authors proposed a new classification system and treatment algorithm for brachial ptosis and described their experience with power-assisted liposuction and lipofilling to treat brachial ptosis without excisional surgery.

Methods: Ninety-five patients with grades 1, 2, or 3 brachial ptosis who underwent brachioplasty were evaluated in a prospective study. Power-assisted liposuction was applied to the posterior arm and para-axillary region, and power-assisted lipofilling was applied to the so-called "bicipital triangle" of the medial arm.

Results: The patients' mean age was 39 years, mean body mass index was 28 kg/m^2, mean lipoaspirate volume was 240 mL per arm, and mean fat-injection volume was 110 mL per side. The mean operating time was 50 minutes, and the average follow-up period was 24 months. Hematoma developed in 2 patients who underwent brachioplasty in combination with another body contouring procedure (1 abdominal hematoma and 1 thigh hematoma; 2.1% complication rate). No other complications were recorded.

Conclusions: Brachioplasty by means of power-assisted liposuction and lipofilling is a safe and reliable option that obviates excisional surgery in patients with mild to moderate brachial ptosis.

Level of Evidence: 4

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Since the first descriptions of aesthetic brachioplasty in the 1950s, various surgical techniques and treatment algorithms have been proposed for brachial ptosis.[1,2] Treatment approaches vary according to the grade of the brachial deformity, which is derived from the amount of fat excess and the location and severity of skin redundancies.[1,3,4] Since the 1980s, surgical treatments for brachial ptosis have included liposuction, excisional surgery, or a combination of these techniques in a single session or as a staged procedure.[5-12] More recently, brachial implantation has been shown to improve the contour of the arm and tighten sagging skin.[13] However, postoperative complication rates as high as 40% have been reported with these surgeries, with residual contour deformities and unattractive scarring (eg, hypertrophic and widened scars or unfavorable scar locations) being the most common complications.[3,8,9,14,15] Surgical procedures that involve substantial liposuction (ie, ≤600 mL per arm) and minimize skin excision have been shown to improve the aesthetic results of brachioplasty.[1-3,9-12,16-22]

We have observed that patients with brachial ptosis present with a minimal to severe contour depression of the medial arm. This contour depression usually is associated

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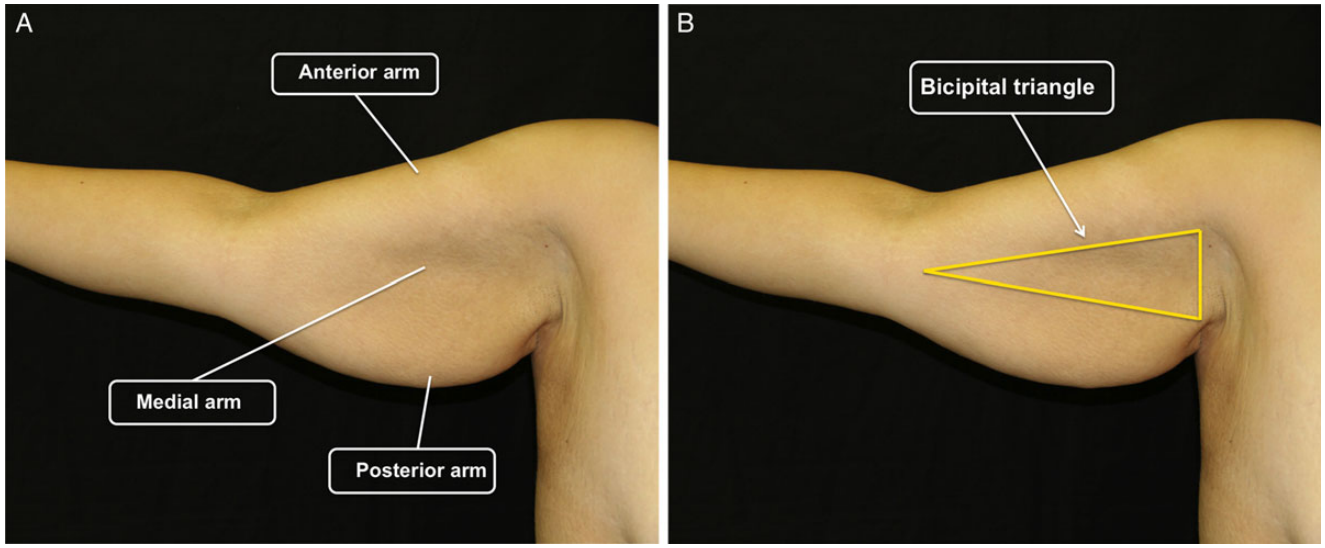

Figure 1. (A) Preoperative photograph of this 26-year-old woman who presented with brachial ptosis. The patient's shoulder is abducted 90 degrees and the elbow is extended. The anterior, medial, and posterior arm zones are indicated. (B) The bicipital triangle corresponds to a region of the medial arm (deemed zone 2) that is deficient in volume. The apex of the bicipital triangle is proximal to the medial epicondyle, and the base is at the axilla.

with skin and fat excesses of the posterior arm, but occasionally occurs in patients with a normal posterior arm. The region of depression is triangular and is located at the bicipital groove; therefore, we refer to it as the "bicipital triangle" (Figure 1). The apex of the bicipital triangle is approximately 3 cm proximal to the medial epicondyle, and the base is at the axilla. Because the addition of volume in brachioplasty can resolve wrinkling and lift tissue, we presumed that fat grafting to the bicipital triangle could create an aesthetically pleasing contour of the medial arm. Fat grafting also could improve the shape of the posterior arm by lifting and tightening ptotic posterior skin and could obviate excisional surgery and associated wound complications. Similar assumptions have been made regarding fat grafting to the face[23] and implant placement in the arm.[13]

We incorporated our observations of the bicipital triangle into a novel system for classifying brachial deformities (Figure 2 and Table 1) that is based on the following 4 treatment zones: the anteromedial/anterolateral arm (zone 1), the bicipital triangle (zone 2), the posteromedial/posterolateral arm (zone 3), and the para-axillary region (zone 4; Figure 3). Grade 1 brachial ptosis is characterized by minimal fat and skin excesses, grade 2 includes minimal skin sagging and fat excess, and grade 3 comprises moderate skin sagging and fat excess (Table 1). We also developed a treatment algorithm that includes: 1) liposuction of the posterior aspect of the arm and the para-axillary area with a power-assisted device; 2) tunnelization of the anterior and posterior zones of the arms to assist with posterior retraction of ptotic skin; and 3) lipofilling of the bicipital triangle to restore an aesthetically pleasing contour and lift the ptotic skin of the posterior arm.

The surgical algorithm described in this study is indicated for patients with grade 2 or 3 ptosis. Patients with grade 1a or 1b ptosis could benefit from lipofilling or liposuction, respectively. Patients with grade 4 ptosis require a staged surgical procedure that involves liposuction, lipofilling, and skin excision to treat excessive sagging of the posterior arm.

METHODS

Patients and Study Design

A total of 130 patients who presented with brachial ptosis and underwent brachioplasty from January 2009 to January 2013 were considered for a prospective study. Patients were evaluated clinically with regard to brachial ptosis and were stratified according to our classification system as follows: grade 1, 9 patients; grade 2, 32 patients; grade 3, 54 patients; and grade 4, 35 patients. Patients with grade 4 ptosis were excluded from the study. Also excluded were smokers, patients with lymphedema of the arms secondary to ancillary procedures, and patients with neurologic, vascular, or connective-tissue disorders of the upper extremities. Included in the study were patients with contour irregularities of the arm and grades 1, 2, or 3 brachial ptosis who wished to avoid a brachioplasty scar.

All patients were supplied with detailed information regarding the surgical procedure and the risks and benefits of various surgical options. Patients were informed preoperatively that their surgical results would not be immediately apparent, that wrinkling of the posterior region of the arm

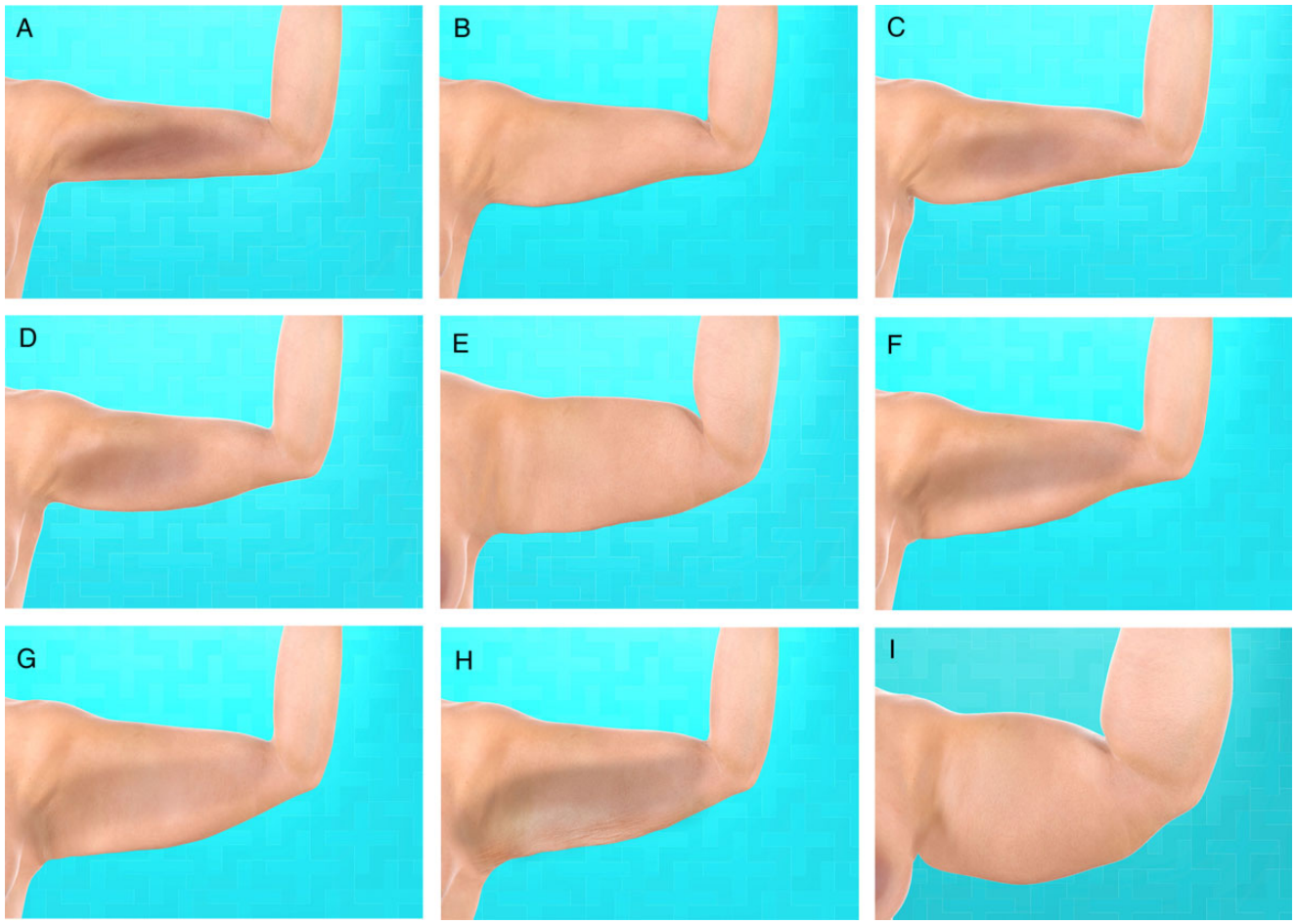

Figure 2. Illustrations of the 4 grades of brachial ptosis described in this study. Images were generated with Maya 3D animation software (Autodesk, Inc, Mill Valley, CA), Photoshop (Adobe Systems, San Jose, CA), and Zbrush (Pixologic, Los Angeles, CA). (A) For patients with grade 1a ptosis, arm contour is inadequate, and a depression of the bicipital triangle (zone 2) can be observed. These patients do not have an excess of fatty deposits or skin laxity in the posterior part of the arm (zone 3). Treatment of these patients includes lipofilling of zone 2 to improve the aesthetic contour of the arm. (B) Patients with grade 1b ptosis present with minimal skin laxity, excess fat in zone 3, and a normal contour of zone 2. For these patients, simple liposuction of zone 3 is sufficient to restore the overall contour of the arm. (C) For patients with grade 2a ptosis, arm contour is lacking owing to minimal skin laxity and minimal to moderate fat excess in zone 3 as well as a flattened or depressed zone 2. These patients can be treated with liposuction of zone 3 combined with lipofilling of zone 2. (D) Compared with (C), patients with grade 2b ptosis have a more pronounced zone 3 and a flatter zone 2. Therefore, treatment of these patients involves more liposuction of zone 3 and more lipofilling of zone 2. (E) Patients with grade 3a ptosis have moderate amounts of skin laxity and fat excess in zone 3. These patients usually are obese and have good skin tone and a well-contoured zone 2. Therefore, liposuction of zone 3 is sufficient to restore arm contour. (F) For patients with grade 3b ptosis, arm contour is lacking owing to moderate skin laxity and fat excess in zone 3 as well as a moderately flattened zone 2. These patients can be treated by combining liposuction and lipofilling of zones 3 and 2, respectively, to restore arm contour. (G) Patients with grade 4a ptosis have moderate skin excess and severe fat excess in zone 3 as well as a flattened or depressed zone 2. Treatment of these patients may be carried out in 1 surgical session during which liposuction and skin excision are performed concurrently. Alternatively, these patients may undergo staged procedures in which liposuction and lipofilling are performed in 1 session, and excisional surgery is performed in a subsequent session. (H) In general, patients with grade 4b ptosis have undergone massive weight loss and present with severe wrinkling and skin excess, moderate fat excess in zone 3, and a severely depressed zone 2. As in (G), patients with grade 4b ptosis may undergo liposuction and excisional surgery in a single session, or they may chose to undergo liposuction and lipofilling in 1 session and excisional surgery in a subsequent session. (I) Patients with grade 4c ptosis usually are morbidly obese and present with a globally oversized arm, characterized by severe skin and fat excesses in zone 3 and an overfilled zone 2. These patients are not candidates for body contouring and should reduce their weight before undergoing brachioplasty.

Table 1. Algorithm for Brachioplasty by Power-Assisted Liposuction and Fat Transfer

Ptosis Grade	Skin Excess	Fat Excess	Contour Depression of Bicipital Triangle	Approach for Surgical Treatment
1a	None	None	Minimal	Lipofilling
1b	Minimal	Minimal	None	Liposuction
2a	Minimal	Minimal to Moderate	Minimal	Liposuction (0-100 mL) and lipofilling
2b	Minimal	Moderate	Moderate	Liposuction (100-200 mL) and lipofilling
3a	Moderate	Moderate	None	Liposuction (200-400 mL)
3b	Moderate	Moderate	Moderate	Liposuction (200-400 mL) and lipofilling[a]
4a[b]	Moderate	Severe	Moderate to severe	Single session or staged procedure of liposuction (>400 mL), lipofilling, and skin excision
4b[b]	Severe	Moderate	Severe	Single session or staged procedure of liposuction (<400 mL), lipofilling, and skin excision
4c[c]	Severe	Severe	None	Weight reduction

[a]If revisional surgery is warranted following liposuction/lipofilling to address grade 3b ptosis, the resulting scar is smaller than with traditional excisional brachioplasty. [b]If the patient does not wish to undergo a staged procedure consisting of liposuction and lipofilling first and excisional surgery second, then liposuction and excisional surgery can be performed in a single session. The resulting scar would extend to the elbow. [c]Patients with grade 4c ptosis typically are morbidly obese with massive skin and fat excesses. These patients should be advised to lose weight before undergoing brachioplasty.

was likely to occur in the early postoperative period, and that skin retraction would occur gradually over a three month period. The possibility of persistent residual wrinkling following the procedure, potentially requiring revisional surgery, was discussed. Patients were advised to make financial arrangements to support a secondary brachioplasty if deemed necessary. Patients who declined to undergo the procedure after receiving this information were excluded from the study. Because this was not a comparative study, we did not evaluate patients who wished to undergo traditional brachioplasty (ie, with skin excision) rather than our proposed technique (ie, without skin excision). The 95 patients included in the study provided written informed consent.

Medical charts were reviewed preoperatively, and patient demographics, including age, gender, method of weight loss, body mass index, and comorbidities, were recorded. Because all patients underwent surgery in a private practice, approval from an institutional review board or ethics committee was not obtained. This study was conducted in accordance with the principles set forth in the Declaration of Helsinki.

Surgical Procedures and Postoperative Care

Each patient was asked to stand with shoulders abducted 90 degrees and with elbows extended and then flexed. The 4 treatment zones of the arm and contiguous para-axillary regions were marked preoperatively (Figure 3). Zone 1 comprised the anteromedial and anterolateral arm and was treated with subcutaneous tunnelization. Zone 2 comprised the bicipital triangle, which is characterized by a contour depression in patients with grades 1a, 2a, 2b, 3b, 4a, and 4b ptosis. This zone was treated with lipofilling. Zone 3 included the posteromedial and posterolateral aspects of the arm, in which excess subcutaneous fat and ptotic skin are located. Liposuction and tunnelization were applied to zone 3; conventional brachioplasty techniques typically involve skin and subcutaneous fat excision in this zone. Zone 4 comprised the para-axillary region (ie, the lateral pectoral zone and the upper back); this zone was treated with liposuction and subcutaneous tunnelization. In addition, the primary fat-donor sites were marked along the posterior zone of the arm. The flanks and/or thighs also were marked when additional fat was needed for injection into the bicipital triangle.

The patient was positioned supine for the entire operation. Intraoperative and postoperative parameters, including the lipoaspirate volume, the volume of fat injected, the operating time, and the incidence of complications, were recorded. A single power-assisted liposuction system (Lipomatic Eva SP, Euromi SA, Verviers, Belgium) was employed to infiltrate tissue with Klein's solution, perform liposuction, and transfer fat. A video demonstrating these preoperative markings and surgical procedures in a 26-year-old woman may be viewed at www.aestheticsurgeryjournal.com.

Zone 3 was infiltrated with Klein's solution and was subsequently deflated by means of a customized, multiple-hole, v-shaped cannula (diameter, 3 mm) attached to a handpiece and set to 3 bars handpiece pressure and 0.7 atm suction pressure. Liposuction was performed in the deep and superficial subcutaneous planes until the results of a pinch test were approximately 1 cm. When necessary, zone 4 was infiltrated and deflated by the same approach.

The lipoaspirate was placed under gentle pressure on an abdominal pad to rapidly separate the adipose tissue from blood

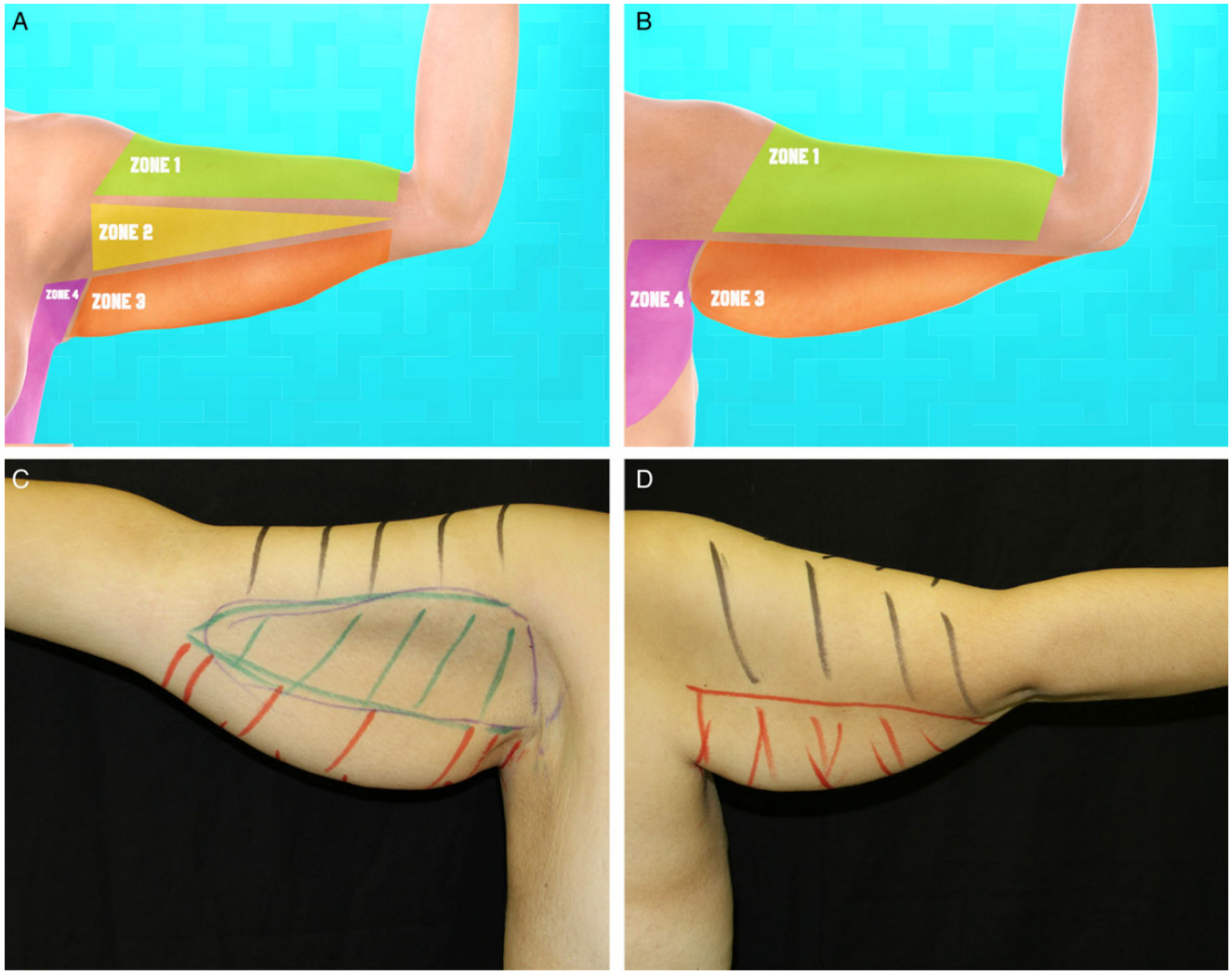

Figure 3. Illustrations of the 4 treatment zones of the arm as viewed from (A) the front and (B) the back. Images were generated with Maya 3D animation software (Autodesk, Inc), Photoshop (Adobe Systems), and Zbrush (Pixologic). Zone 1 (green) corresponds to the anteromedial/anterolateral arm and is treated with subcutaneous tunnelization. Zone 2 (yellow) corresponds to the bicipital triangle and is treated by lipofilling. Zone 3 (red) and zone 4 (purple) correspond to the posteromedial/posterolateral arm and the para-axillary region, respectively. These zones are treated with liposuction and subcutaneous tunnelization. (C) Front-view and (D) rear-view photographs of this 26-year-old woman who presented with grade 3b brachial ptosis. The patient underwent preoperative marking of the treatment zones, as follows: black, zone 1; green, zone 2; and red, zone 3. Zone 4 was not marked for this patient because treatment of this region was not required.

and crystalloids without destroying fat cells. The remaining solution of adipose tissue was collected into sterile 60-mL syringes. To shorten the time that harvested fat was kept outside the body and to decrease the overall operating time, 2 surgical teams performed these procedures. Specifically, the surgeon performed liposuction of the arm and harvested the lipoaspirate while the assistant strained the lipoaspirate and transferred adipose tissue to the syringes. When needed, this procedure was applied to harvest and prepare additional fat from the flanks or thighs.

Aspiration was disabled in the power-assisted liposuction system, and multilayered and multidirectional tunnelization was achieved through multiple access points in the subcutaneous plane of zones 1, 2, 3, and 4. Tunnelization in zone 2 was performed to prepare a matrix for fat injection. Harvested fat was grafted into zone 2 through a customized v-shaped cannula (3 holes, 3 mm in diameter) with simultaneous vibration of the recipient site. Fat also was injected in the subcutaneous plane along access points at the apex and anterior and posterior edges of the bicipital triangle. This region was carefully overfilled to accommodate some resorption of injected fat.

Patients were advised to utilize compression garments for 2 weeks postoperatively. If deemed tolerable by the

Table 2. Patient Demographics and Surgical Data

	Study Group (N = 95)
Mean age (range), years	39 (19-58)
Mean BMI (range), kg/m^2	28 (21-36)
Mean lipoaspirate volume per arm (range), mL	240 (0-450)
Mean arm fat injection volume per side (range), mL	100 (0-220)
Mean operating time (range), minutes	50 (45-60)
Mean no. of sessions (range)	1.1 (1-2)
Mean follow-up (range), months	24 (12-48)

BMI, body mass index.

patient, deep lymphatic massage was recommended to decrease contour deformities and resolve edema more quickly.

Assessment of Patient Satisfaction

At 6 months postoperatively, patients were asked to complete a nonanonymous questionnaire prepared by the authors (a blank copy of the questionnaire is available as Supplementary Material at www.aestheticsurgeryjournal.com). The results of the questionnaire were analyzed to determine the psychological and physical well-being of each patient preoperatively and at 6 months postoperatively and to assess patient satisfaction with the surgical outcomes.

RESULTS

Of 95 women who underwent brachioplasty by means of liposuction and fat transfer, 45 patients (47.4%) underwent brachioplasty as the sole procedure, and 50 patients (52.6%) underwent brachioplasty combined with another body contouring procedure (abdominoplasty, thighlift, back lift, and mastopexy). Prior to undergoing brachioplasty, 41 patients (43.1%) underwent a bariatric procedure for weight loss, whereas 26 patients (27.3%) lost weight through diet and exercise alone. No men presented to our practice for brachioplasty during the study period.

It is important to inform patients that skin retraction occurs gradually after power-assisted liposuction and lipofilling of the arm. Wrinkling of the posterior arm also may be observed while edema and inflammation resolve, especially for patients who present with grade 3 ptosis. In our experience, the grade of brachial ptosis did not correlate with patient preference for a specific surgical procedure (ie, with or without skin excision). Three patients with grade 3 ptosis and 3 patients with grade 2 ptosis declined to undergo our novel brachioplasty technique.

The mean age of the patients was 39 years (range, 19-58 years), and the mean body mass index was 28 kg/m^2 (range, 21-36 kg/m^2) (Table 2). The mean lipoaspirate volume was 240 mL per arm (range, 0-450 mL per arm), and the mean fat injection volume was 100 mL per side per session (range, 0-220 mL per side per session). The mean operating time for brachioplasty was 50 minutes (range, 45-60 minutes), and an average of 1.1 sessions (range, 1-2 sessions) were required to achieve the desired outcome. The mean follow-up period was 24 months (range, 12-48 months). Patients who underwent only brachioplasty were discharged the same day as the surgery, returned to sedentary activities at 7 days postoperatively, and resumed full activity at 3 weeks postoperatively. The average hospital stay for patients who underwent brachioplasty in combination with another procedure was 2.3 days (range, 1-4 days; Figures 4-5 and Supplemental Figures 1-2 [available online at www.aestheticsurgeryjournal.com]).

The overall complication rate was 2.1% (2 of 95 patients). None of the patients experienced major complications, such as lymphedema, skin necrosis, or nerve injuries. No complications developed in patients who underwent brachioplasty alone. Abdominal hematoma occurred in 1 patient who underwent brachioplasty in combination with lipoabdominoplasty, and unilateral thigh hematoma developed in 1 patient who received brachioplasty in combination with thigh lift (Table 3).

Eighty-seven of the 95 patients (91.6%) completed a questionnaire 6 months postoperatively (Figure 6). Six patients (6.3%) declined to complete the questionnaire at the beginning of the study (ie, before undergoing surgery), citing personal reasons. Two patients (2.1%) withdrew from the study before the questionnaire was administered. Therefore, the results of this study were not affected by selection bias. Of 87 survey respondents, 79 (90.8%) indicated that they would repeat the surgical procedure or recommend it to a friend, 78 patients (89.6%) were satisfied with the final shape of their arms, and 80 patients (91.9%) reported improved psychological well-being as a result of the operation (Figure 6).

The overall rate of revision was 9.5% (9 of 95 patients). The 9 patients who underwent revisional surgery originally presented with grade 3b brachial ptosis. Despite improvements in arm shape following power-assisted liposuction and lipofilling, these patients had concerns regarding residual ptosis and persistent wrinkling in the posterior proximal region of the arm and in the para-axillary area. Two of these patients (2.1%) refused revisional surgery consisting of combined liposuction and lipofilling and instead underwent excisional brachioplasty. The remaining 7 patients underwent revisional brachioplasty for contour enhancement by means of power-assisted liposuction and lipofilling. The 9 patients who underwent revisional surgery were asked to complete an additional questionnaire to assess their satisfaction 6 months after the secondary procedure. All 9 patients reported improvements in arm shape following the revisional procedure, and none of the patients sought additional arm surgery.

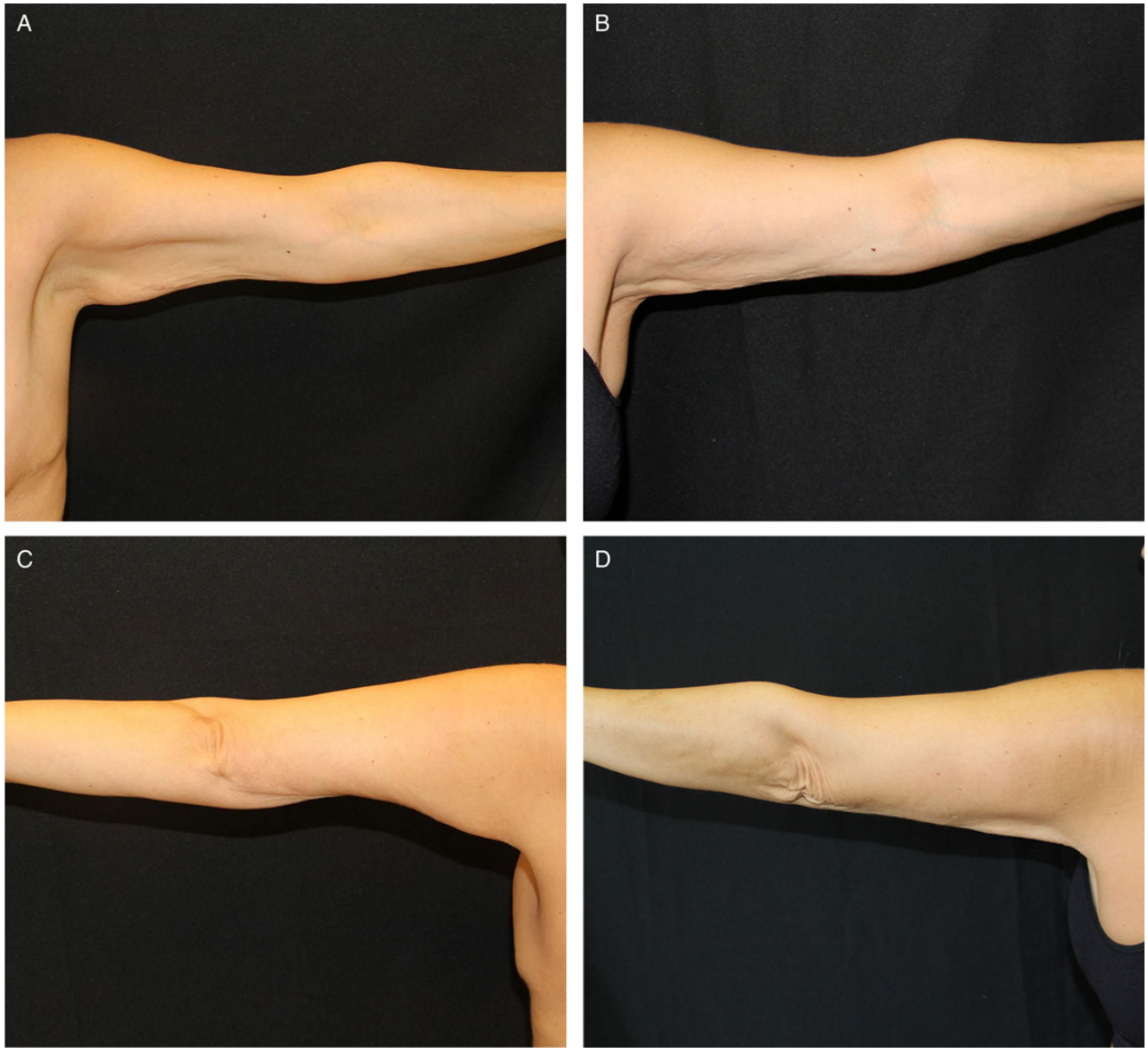

Figure 4. (A, C) This 47-year-old woman presented with grade 1a brachial ptosis. She underwent power-assisted transfer of 140 mL of autologous fat to the bicipital triangle of each arm. (B, D) Two years postoperatively.

DISCUSSION

Despite numerous studies aimed at classifying and surgically correcting brachial deformities, unfavorable scarring and considerable complication rates have persisted.[3,8,9,14,15] Many authors have described liposuction of the arm as a safe and effective treatment strategy for brachial ptosis.[3,5,6,9-12,16-19] Liposuction may be performed alone or in combination with skin excision to improve the contour of the arm, decrease bulkiness, loosen subcutaneous tissue, and enhance the aesthetic results of brachioplasty.[1-3,20] Gilliland and Lyos[9,10] have advocated circumferential para-axillary liposuction in the superficial and/or subdermal planes to improve skin retraction. These authors also demonstrated the reliability of liposuction to effect skin retraction in the posteromedial and posterolateral aspects of the arm.

Herein we described a novel surgical treatment for patients with mild to moderate brachial ptosis (ie, grades 1, 2, or 3) that combines liposuction and lipofilling of the arm and obviates skin excision. This procedure involves deflation of the ptotic region of the arm (zone 3) and lipofilling of the bicipital triangle (zone 2). Liposuction of zone 3 helps to tighten the skin. Fat transfer to zone 2 fills the depression at the bicipital triangle and places upward

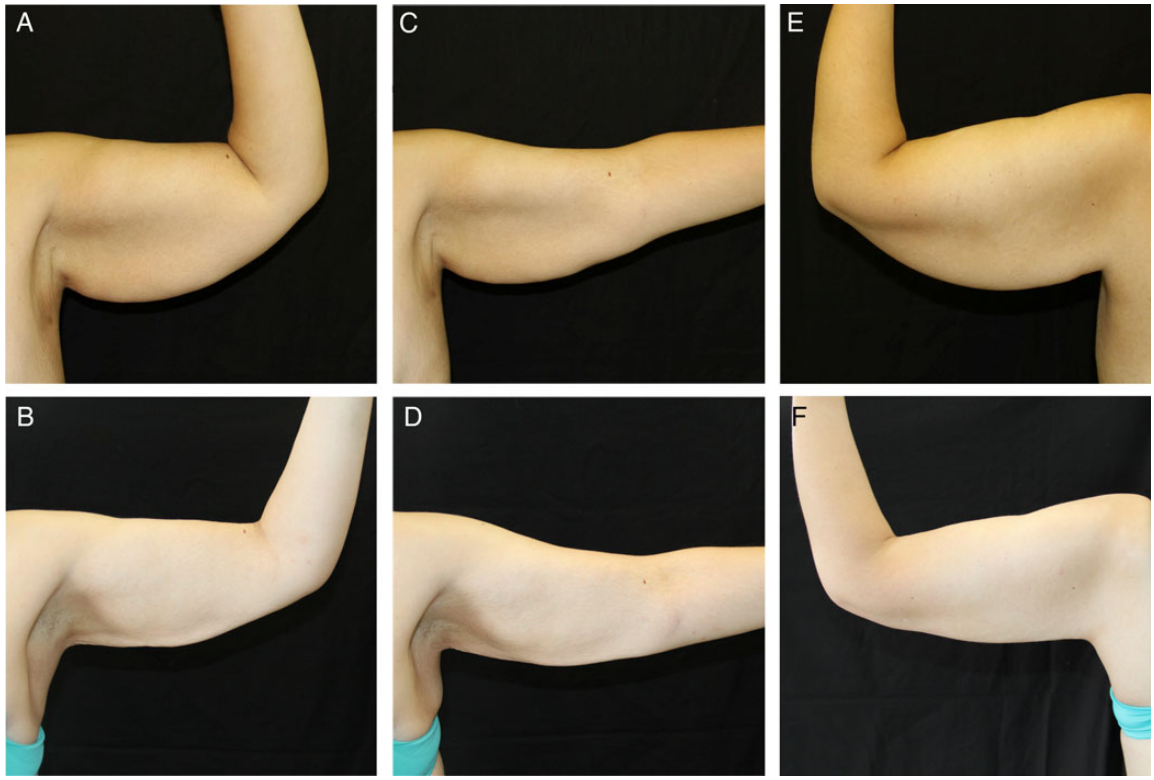

Figure 5. (A, C, E) This 26-year-old woman presented with grade 3b brachial ptosis and underwent liposuction of zone 3 of each arm (lipoaspirate, 300 mL per arm) and transfer of autologous fat (180 mL per arm) to the bicipital triangle of each arm. (B, D, F) One year postoperatively.

Table 3. Complications of Brachioplasty Alone or Combined With Additional Body Contouring Procedures (N = 95)

Complication	No. of patients (%)
Hematoma[a]	2 (2.1)
Seroma	0 (0)
Infection	0 (0)
Wound dehiscence	0 (0)
Embolism	0 (0)

There were no complications among patients who underwent brachioplasty as the only procedure.[a]An abdominal hematoma developed in 1 patient who underwent brachioplasty combined with lipoabdominoplasty. A unilateral thigh hematoma occurred in 1 patient who underwent brachioplasty combined with thigh lift.

tension on zone 3, thereby supporting and redraping ptotic skin and restoring a pleasing contour of the arm in patients with grade 2 or 3 ptosis. Lipofilling also lifts the posterior ptotic skin of the arm through volumization effects that recruit skin from the deflated region of the posterior arm. Because the subcutaneous space of the bicipital triangle is large, upward tension on the abundant skin excess skin of the posterior arm is unlikely to be problematic.

Our technique of power-assisted fat injection expands the recipient site by means of vibration and multilayered tunnelization. We suggest that the process of thrusting the cannula in the superficial subcutaneous spaces of the arm releases tethered tissues in this region and facilitates postoperative skin retraction. These maneuvers maximize the dispersal and expansion of fat in the subcutaneous space, thereby creating an ideal substrate for fat grafting[24,25] and optimizing graft survival by minimizing tension and preventing fat lobules from crowding.

A moderate volume of fat must be injected for sufficient brachial rejuvenation. We cannot rule out that conventional methods of fat preparation[23] and injection might be as effective as our method of power-assisted fat transfer. We chose to adapt power-assisted fat grafting to brachial ptosis because we previously demonstrated favorable results when applying this procedure to augment the breasts[24] and gluteal region.[25] Because our technique obviates skin excision and consequent scarring, it is likely to have lower rates of complication and morbidity. Patients who undergo power-assisted fat grafting recover more quickly and can resume daily activities in a timely fashion. Our technique shortens the operating time and decreases surgical risks and complications for patients who undergo

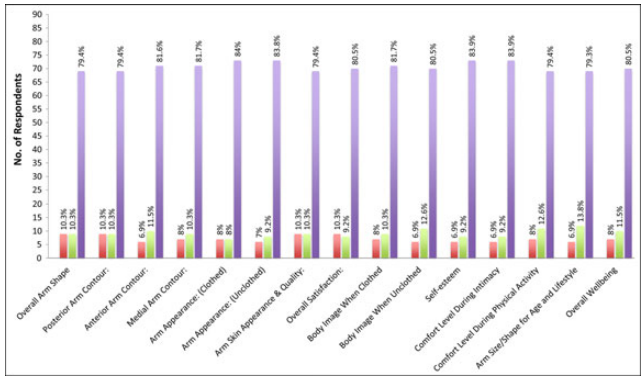

Figure 6. Results of the patient satisfaction questionnaire, which was administered at 6 months postoperatively and was completed by 87 of 95 patients (91.6%). Seventy-nine respondents (90.8%) indicated that they would repeat the surgical procedure or recommend it to a friend. Blue bars indicate responses 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."

brachioplasty in combination with other body contouring procedures.

Patients with grade 4 ptosis often have poor skin quality. For these patients, liposuction combined with dermolipectomy of the arm have been shown to decrease the amount of skin excision needed and thus the length of the scar.[9,10,16,17,21] For patients with massive brachial ptosis and poor skin tone, the benefits of liposuction are questionable, especially if skin retraction is likely to be insufficient. However, skin excision with a short scar can be performed at a second surgical session if the outcomes of liposuction alone include residual contour deformities or if the patient requests additional treatment.

Study Limitations

Patient satisfaction was evaluated 6 months postoperatively by means of a nonanonymous questionnaire that was prepared by the authors. The timing of this assessment may have been premature. An evaluation of patient satisfaction at 1 or 2 years postoperatively would further validate the present study and might yield different results. In addition, power-assisted liposuction and lipofilling are not indicated for all grades of brachial ptosis. Patients with grade 4 ptosis require excisional surgery alone or as a staged procedure with liposuction and lipofilling. We did not include patients with grade 4 ptosis in the present study because our aim was to validate this technique for patients with mild to moderate ptosis (ie, grades 1, 2, or 3). An evaluation of the utility of this technique for patients with grade 4 ptosis is warranted. Finally, the effects of tunnelization and vibration detailed in this study are based on the authors' observations. A clinical study involving a control group is needed to determine the precise benefits of these surgical maneuvers.

CONCLUSIONS

We described a classification system and treatment algorithm for rejuvenation of the arm, associated with minimal complications. The ptotic brachial region is delineated into 4 zones that are treated by liposuction or lipofilling to achieve an aesthetically pleasing contour. The bicipital triangle (zone 2) is addressed by lipofilling to improve retraction and redraping of the ptotic skin at the posterior arm. Liposuction and fat transfer yield satisfactory results for patients with mild to moderate (grades 1, 2, or 3) brachial ptosis and eliminate the need for excisional surgery. Additional studies are needed to validate this technique for patients with grade 4 brachial ptosis, and patients must be adequately informed and carefully selected for this surgical procedure. To our knowledge, this is the first study to involve a bicipital triangle in the classification and treatment of brachial ptosis and to employ power-assisted fat injection into the arm.

Supplementary Material

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

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Disclosures

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