Lipomodeling: An Innovative Approach to Global Volumetric Rejuvenation of the Hand

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Abstract

Background: Rejuvenation of the hand, particularly the dorsum, has garnered increased attention because of its unique aesthetic importance. Various methods have been advocated for achieving optimal aesthetic results.

Objectives: The authors describe their experience applying lipotransfer to total hand rejuvenation, including rejuvenation of the radial and ulnar aspects of the fingers.

Methods: The authors conducted a retrospective review of 22 women who underwent global hand rejuvenation by lipotransfer. Aesthetic outcomes were assessed objectively by serial photography and subjectively by patient self-assessments.

Results: No major postoperative complications were observed. Of 22 patients, 21 indicated that they were "satisfied" or "very satisfied" with the procedure. Plastic surgeons noted improvement in the aesthetic appearance of the hands after treatment.

Conclusions: Global hand rejuvenation should aim to restore volume and reduce skin laxity to reverse the signs of extrinsic aging. The fingers represent almost 50% of the length of the hand and should be included in treatments to achieve optimal aesthetic outcomes.

Level of Evidence: 4

The hands are an aesthetically important, visible area of the body that, together with the face, can be considered a reflection of a patient’s age. Hand rejuvenation has increased in popularity, but no standard approach exists for hand rejuvenation because a consensus regarding the ideal aesthetic appearance of the hands is lacking.1-3

In 1931, Kretschmer4 proposed the first classification of hands according to body habitus, as follows: (1) asthenic, corresponding to an ectomorphic body type with long, slender hands and long fingers; (2) athletic, characterized by a mesomorphic body type with rough, wide, and balanced hands; and (3) pyknic, corresponding to an endomorphic body type with a short, wide dorsum of the hand and short, conical fingers. In 1959, Von Lanz and Wachsmuth2 determined that the dominant hand is slightly larger than the nondominant hand and that left-handed individuals have a larger right hand because of ambidexterity. Burger noted that hand volume in females was 25% less than in age-matched males.3

A long and slender hand generally is regarded as elegant and aesthetically pleasing.1 Soft tissue bulk softens the contours of the hand and adds volume. Women undergo hand rejuvenation much more frequently than men; this difference likely results from the increased self-care activities performed by women and the differing anatomic features of the female hand.3 Specifically, female hands are characterized by

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more predominant subcutaneous fat and by tendons that are noticeable during flexion and extension.1

The aesthetic importance of the dorsum of the hand has been addressed in several studies, and the dorsum is emphasized in global hand rejuvenation. However, the appearance of the fingers is essential to the overall aesthetic of the hand. Soft tissue coverage of the fingers is important to the appearance of the hand because subcutaneous fat fills the diaphyseal concavity of the ulnar and radial aspects, resulting in an hourglass appearance.3-6 Maintenance of the proximal interphalangeal (PIP) joint is essential to obtain satisfactory outcomes of hand rejuvenation, because the PIP joint expands the radial and ulnar surfaces over time.7-9 The dorsal surface of the finger is 12% larger than the palmar surface, and the dorsal skin is less mobile over the distal phalanx, compared with the proximal phalanx.5 Unlike palmar skin, dorsal skin tends to show signs of aging, and its thickness decreases from 1.2 mm at 25 years of age to 0.75 mm at 70 years of age. A visible bony frame, the white color of the tendons, the bluish color of the veins, and the transparent quality of the skin contribute to the appearance of extrinsic aging of the hands.6-8

Knowledge of hand anatomy is essential to avoid unperceived injuries to noble structures during lipotransfer for hand rejuvenation. The dorsum of the hand comprises superficial, intermediate, and deep layers of fat. Noble structures of the hand include vessels and sensory nerves in the intermediate compartment and extensor tendons in the deep compartment. The superficial and intermediate layers are separated by the superficial fascia, an extension of the antebrachial fascia; the intermediate and deep layers are separated by the deep muscular fascia, which is continuous with the periosteum overlying the dorsal aspect of the metacarpals. The thickness of the superficial layer of fat corresponds to body mass index. Because the superficial layer is devoid of noble structures, fat grafting into this compartment is considered safe.10 Hand rejuvenation by structural fat grafting, defined as the subcutaneous placement of fat in a purposeful, structured manner, has been described by Coleman11 and is regarded as a standard, safe procedure to enhance hand appearance. However, this approach involves limited lipotransfer to the PIP joint and neglects the most distal phalanxes.

In this study, we present our experience with total hand rejuvenation by lipotransfer that addresses the phalanxes and their radial and ulnar aspects. We regard the hand, including the dorsum and fingers, as a unique aesthetic unit.

**METHODS**

**Study Design**

In this retrospective review, the authors analyzed the medical charts of 22 consecutive, nonrandomized patients who underwent lipotransfer of the hands for aesthetic reasons. All patients were treated in a private practice (Centro Chirurgo San Paolo, Pistoia, Italy) between January 2005 and December 2013. All patients provided written informed consent.

**Surgical Technique**

All procedures were performed under conscious sedation by the same surgeon. Local anesthesia was achieved with Klein’s solution (0.2% lidocaine) at the donor site and with median and ulnar blocks at the receiving sites. All patients received a single dose of antibiotics intraoperatively. Fat was harvested from the abdomen through an umbilical incision by means of a blunt cannula attached to a 10 mL syringe (Tulip Medical Products, San Diego, CA). The blunt cannula was selected to reduce the risk of injury to the small vessels (Figure 1).10,11 Harvested fat was centrifuged at 3600 revolutions per minute for 3 minutes.11

The fat was transferred to 1 mL syringes (Tulip Medical Products) connected to cannulae for injection into the receiving site. For each patient, six surgical accesses were made through a 16-gauge needle. The first access was positioned at the center of the wrist, such that the incision could be concealed by wearing a wristwatch after surgery. This access provided easy entry to the entire dorsum. Five additional accesses were made in the interphalangeal folds, enabling lipotransfer to the radial and ulnar aspects of the fingers to the most distal phalanx (Figure 2). These

![Figure 1. Schematic representation of lipotransfer to the hand. The safety of fat grafting is improved by applying a blunt cannula to the superficial layer of fat, because this layer is devoid of important anatomic structures.](image-url)
accesses also permitted full coverage of the dorsum, thereby simplifying retrograde and intertwined fat grafting over the dorsal surface of the hand (Figure 3A).

All patients underwent fat grafting in the superficial fat layer of the hand, which was accessed by inserting the injection cannula immediately below the skin and above the tendons and dorsal veins. The grafting technique consisted of tunneling and linear retrograde threading. Several tunnels were made to maximize contact between the grafted fat and the receiving site to encourage nutrition, respiration, stability, integration, and uniformity of the fat graft, as advocated by Coleman.11 Approximately 15 mL (range, 10–20 mL) of centrifuged fat was injected into the dorsum of each hand, and each aspect (radial and ulnar) of the hand received 0.5 mL of fat. The procedure lasted an average of 20 minutes per hand (range, 10–30 minutes per hand). Care was taken to fill the dorsum, the intercarpal spaces, and the radial and ulnar aspects of the fingers to the distal phalanx of each finger. Immediately after fat grafting, the hands appeared just slightly overfilled (Figure 3B). The surgical accesses were taped closed, and massage was performed to adjust any irregularities in fat placement and achieve proper distribution and filling.

Postoperative Care

Patients were instructed to elevate their hands for 2 days postoperatively and to avoid manual activity for 1 week.11 Patients were informed that substantial edema and a bluish tint might be observable in the hands for 3 to 4 days postoperatively. A conveniently-shaped Reston foam pad (3M, St Paul, MN) was placed over the dorsum of each hand to protect the area without restricting mobility. This dressing has been shown to reduce waviness in the skin surface, improve comfort during recovery, and reduce blood loss and ecchymosis.12,13 Based on our experience, this dressing encourages faster recovery and prevents migration of the fat graft. The dressing was removed 10 days postoperatively.

Assessment of Outcomes

Aesthetic results following lipotransfer were assessed objectively by serial photography and subjectively by patient self-assessments conducted 8 months postoperatively. Patients were asked to rate their overall satisfaction with global volumetric rejuvenation of the hand as: 1, completely dissatisfied; 2, dissatisfied; 3, neutral; 4, satisfied; or 5, very satisfied. The questionnaire was administered 12 months postoperatively by nurses in our practice. Patient self-assessments were not made anonymous to ensure that subsequent operations could be offered in cases of excessive graft resorption. Two plastic surgeons who were not involved in the study evaluated serial photographs of patients following lipotransfer and rated the aesthetic results as “very much improved,” “significantly improved,” “no change,” “significantly worse,” or “very much worse.”

Statistical Analysis

Statistical analyses were conducted with PASW, version 18.0 (IBM, Armonk, NY). Descriptive statistics were represented as numbers and percentages of patients or as means or ranges with standard deviations.

RESULTS

This study included 22 women with a mean age of 55.9 years (range, 41–72 years). No patient had comorbidities. Our retrospective review included each patient’s presenting concerns, the interval between the first visit and lipotransfer, relevant previous treatments, the amount of fat injected, postoperative complications, and clinical photographs. Mean follow-up for all patients was 38 months (range, 10–88 months).

Complications considered common to this procedure13 (eg, allergic dermatitis, bullae formation, and postinflammatory hyperpigmentation) were absent from patients in this study. The patients indicated no postsurgical concerns, and they tolerated the dressing well. In general, patients...
preferred more protective postoperative dressing when performing daily activities. No major postoperative complications (e.g., contour deformity, inflammatory symptoms, and stiffness) were registered. Three of 22 patients (13.6%) experienced sensory dysfunction in the fingers at the level of the distal phalanxes; this resolved spontaneously within 1 month following surgery. All patients had postoperative edema that resolved within 15 days postoperatively.

The amount of resorbed fat was evaluated clinically because the patients did not undergo preoperative radiography. None of the patients (0%) indicated dissatisfaction with the aesthetic results of hand rejuvenation by lipotransfer. One patient (4.5%) assessed her satisfaction level as neutral and was considered unsatisfied (Figure 4). Three patients (13.6%) were satisfied, and 18 patients (81.8%) were very satisfied. Sixteen of 22 patients (72.7%) were unable to wear their rings postoperatively because of the increased volume of the fingers. Eleven of these 16 patients (68.8%) did not consider increased finger volume to be an inconvenience, and five patients (31.2%) did. Aesthetic results, assessed objectively by two independent plastic surgeons, were rated as “very much improved” (18 of 22 patients, 81.8%) or as “significantly improved” (4 of 22 patients, 18.2%; Figure 5). Specific cases are presented in Figure 6 and Supplementary Figure 1. As noted previously by Coleman, hand rejuvenation by lipotransfer increased the quality and texture of the skin; this result can be attributed to the delivery of adipose-derived stem cells (Supplementary Figure 1C–D).

**DISCUSSION**

Other than the face and neck, the hands are the most visible parts of the clothed body. However, the advancement of hand rejuvenation has not been emphasized in...
cosmetic surgery, and corresponding studies primarily address dorsum rejuvenation without considering the fingers.\(^\text{15}\) Demand for whole-hand rejuvenation has increased as patients wish to avoid contrast with rejuvenated faces and necks.\(^\text{2,3}\)

Both conservative and invasive approaches have been proposed as optimal for hand rejuvenation. Sclerotherapy and phlebectomy temporarily reduce visible veins but increase the risk of edema due to impaired venous return, since the hand is not equipped with an adequate source of deep venous drainage.\(^\text{14}\) Resorbable or semipermanent filler injections represent a valuable alternative for patients who prefer a conservative approach with no convalescence and a rapid return to daily activities.\(^\text{15-18}\) However, repeat sessions are required to maintain these fillers, resulting in high overall costs due to the volume required. Permanent fillers are effective for long-term aesthetic treatment of the dorsum of the hand; however, they are associated with significant side effects.\(^\text{19,20}\) Moreover, overcorrection should be avoided, because dermal fillers cannot easily be removed once injected.\(^\text{20}\) Laser CO\(_2\) resurfacing, intensified pulsed light, and chemical peels have been successfully applied to hand rejuvenation, but these methods require several sessions to achieve patient satisfaction, and sunscreen must be applied for months to avoid dyschromia.\(^\text{21-23}\)

Structural fat grafting is recognized worldwide as an optimal procedure to resolve soft-tissue loss in all areas of the body.\(^\text{7,8,11,23,24}\) This procedure is considered safe, is well tolerated by patients, and is associated with prolonged, pleasant aesthetic outcomes.\(^\text{23,24}\) In addition, structural fat grafting can be performed alone or in combination with other noninvasive approaches.\(^\text{21,22}\) The primary side effect of lipotransfer to the hands is local edema, the severity of which corresponds to the volume of fat grafted. Although Coleman\(^\text{11}\) suggested that at least 20 mL of centrifuged fat should be grafted to achieve good outcomes, we experienced satisfactory outcomes with slightly lower amounts of fat.

Lipomodeling of the fingers is associated with an increase in the diameter of the PIP joint. Careful consideration of the third and fourth fingers is necessary, because many patients wear rings on these fingers. In the present study, all of the patients wore rings daily (eg, wedding rings) or occasionally before undergoing hand rejuvenation. These patients were advised preoperatively of this potential inconvenience, and 16 of 22 patients (72.7%) were unable to continue wearing their rings postoperatively because of increased finger volume at the level of the PIP joints. Eleven of 16 patients (68.8%) did not consider this to be an inconvenience, whereas five patients (31.2%) did. The 11 patients who could not wear their usual rings immediately postoperatively noted that they wore different rings until the postoperative edema resolved, and the original rings fit thereafter. The remaining five patients had to resize or replace their rings.

It is common for rings to no longer fit following lipomodeling of the fingers. However, when treatment of the fingers is omitted from hand rejuvenation, the overall aesthetic outcomes are less satisfactory. In our study group, 21 of 22 patients (95.4%) were satisfied with the results of lipotransfer to the dorsum and fingers. The inconvenience of increased finger volume was mitigated in older patients who had already devised methods for fitting rings. Moreover, tighter rings postoperatively can be interpreted as the result of a successful procedure involving low fat resorption, fine technique, and/or the appropriate amount of fat grafting. Therefore, we do not consider increased finger volume as a disadvantage of total volumetric hand rejuvenation.

A potential limitation of this study was the lack of anonymity in the patient self-assessment of satisfaction. This measure was taken to identify patients requiring subsequent procedures, but we cannot rule out that our lack of anonymity biased patient responses.

A common aim of hand rejuvenation is to achieve a youthful, attractive hand with well-represented soft tissue and no wrinkles, except for flexion creases over the PIP and distal interphalangeal joints. An understanding of the basic principles of 3-D hand aging is necessary to obtain successful aesthetic outcomes.\(^\text{10}\) Previous reports of fat transplantation to the hands indicated unpredictable longevity with harvested fat that was not centrifuged before placement.\(^\text{11,23-25}\) By minimizing the number of injection sites, bruising is reduced considerably without compromising accessibility to the entire hand, including the dorsum and fingers.

Aesthetic results of hand rejuvenation are improved when care is taken to place the harvested, centrifuged fat
immediately subdermally in the superficial fat layer of the hand, as suggested by Coleman\(^\text{11}\) and further emphasized by Bidic et al.\(^\text{10}\) This placement supports the skin while avoiding damage to important anatomic structures in the intermediate and deep layers of fat. Fat is placed in a crisscrossed pattern to encourage uniformity of the grafted tissue and to enhance graft acceptance. This maneuver is associated with superior aesthetic results and only minor complications. Although Coleman\(^\text{11}\) suggests that fat grafting on the fingers should be avoided to maintain finger volume and ring size, we found that patients are usually satisfied with the overall aesthetic outcomes of lipotransfer to the dorsum and fingers. Lipomodeling restores fullness and a youthful appearance to the hands, thereby enhancing the overall appearance of the patient. This is especially true when the patient also has undergone rejuvenation of the face and/or neck and wishes to achieve a consistent appearance. We agree with Coleman\(^\text{11}\) that hand rejuvenation by structural fat grafting produces thickened soft tissue and improved skin quality that persists long after the initial filling. To indicate this longevity, we suggest replacing the terms “lipofilling” or “structural fat grafting” with “lipotransfer” or “lipomodeling.”

Figure 6. (A) This 45-year-old woman presented with visible tendons and veins in the hands, indicative of aging. (B) The patient 16 months after undergoing lipotransfer to the hand, including 15 mL of fat in the dorsum and 0.5 mL of fat in each aspect of the fingers. The increased volume of her fingers postoperatively made wearing rings slightly more difficult, but the patient indicated that this was not an inconvenience.
CONCLUSIONS

Global hand rejuvenation should aim to restore hand volume and reduce skin laxity to reverse signs of extrinsic aging. The fingers represent almost 50% of the length of the hand and should be treated along with the dorsum to obtain optimal aesthetic outcomes. The results of hand rejuvenation by structural fat grafting are more prolonged than those of other rejuvenation methods, perhaps because of a stenting effect of the metacarpals that occurs with neo-vascularization. A single lipotransfer can produce a fuller and more youthful hand, can minimize the appearance of enlarged veins, and can improve the aesthetic of the skin and fingers without producing unintended side effects.

Supplementary Material

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

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