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Lipofilling With Minimal Access Cranial Suspension Lifting for Enhanced Rejuvenation

Joep C. N. Willemsen, MD; Karlijn M. Mulder, MD; and Hieronymus P. J. D. Stevens, MD, PhD

Abstract

Background: Loss of volume is an important aspect in facial aging, but its relevance is frequently neglected during treatment.

Objectives: The authors discuss lipofilling as an ancillary procedure to improve the impact of facelifting procedures.

Methods: Fifty patients who underwent minimal access cranial suspension (MACS) lifting alone were retrospectively analyzed, and their results were compared to 42 retrospective cases of MACS lifting with adjuvant lipofilling. The results were evaluated with a photographic ranking system by two panels (five plastic surgeons and five medical students).

Results: Combined MACS lifting and lipofilling yielded overall cosmetic results that were significantly better than the results achieved with MACS lifting alone. Photographic evaluations showed that improvements were more pronounced in the tear trough (P < .05) and malar eminence (P < .01) than in the nasolabial groove (P > .05).

Conclusions: Volume restoration with lipofilling following MACS lifting procedures produces significantly better postoperative results than MACS lifting alone. This combined procedure produces the most dramatic improvements in the tear trough and malar eminence regions.

Keywords

minimal access cranial suspension lift, lipofilling, ancillary procedure, facelift, facial aging, regenerative surgery

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It has become increasingly accepted that lifting procedures alone are insufficient for achieving the most natural rejuvenation of the aging face in the majority of patients. Important factors in facial aging include the effects of gravity, loss of skin elasticity due to collagen degradation, and loss of volume due to fat atrophy and bone resorption. The loss of volume has been a focus of recent literature, in which it has been described as a major factor in aging. In this article, we investigate the role of lipofilling, also commonly referred to as autologous microfat grafting, as an ancillary procedure to augment the results of a short scar vertical vector facelift. All patients included in this study received vertical repositioning through a minimal access cranial suspension (MACS) lift. In this study, we investigated the role of lipofilling, also commonly referred to as autologous microfat grafting, as an ancillary procedure to augment the results of a short scar vertical vector facelift. All patients included in this study received vertical repositioning through a minimal access cranial suspension (MACS) lift.

METHODS

Surgical Technique

MACS lifting was undertaken as described by Tonnard and Verpaele, with minor modifications only. A curved pretragal incision was made, running vertically upward into the sideburn. Subcutaneous dissection was extended to the anterior border of the parotid gland, 4 cm under the angle of the mandible, clearly revealing the platysma muscle. A pretragal purse-string suture was anchored 1 cm cranially to the helical root, to the deep temporalis fascia. Incorporating the superficial musculoaponeurotic system overlying the parotid gland, the first purse-string suture was run inferiorly in a narrow U-shape, well beyond the angle of the mandible and including the platysma muscle firmly before returning to the starting point 1 cm anterior to the first leg of the suture. This most caudal point of the suture loop was placed lower than initially described by Tonnard and Verpaele.

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Verpaele. This modification yielded a more pronounced effect by flattening the floor of the mouth through a pulley effect over the mandible as the platysma muscle was lifted vertically. The second purse-string suture was more O-shaped. It was placed from the same starting point but directed to the extent of the subcutaneous dissection.

In cases where loss of volume was a clear part of the aging process, lipofilling was performed either during the MACS lift or within one year after initial surgery. The Coleman technique\textsuperscript{9,17} for fat harvesting and injection was employed but refined by utilizing a smaller, custom-made cannula for harvesting (inner diameter, 1.3 mm). The abdomen and upper legs acted as donor sites. The upper legs were the preferred donor site for harvesting, for practical reasons: In female patients, the upper legs yielded consistent quantities of high-quality fat that could be removed with minimal trauma to the graft and minimal discomfort to the patient. The abdomen yielded less consistent quantities of usable fat compared to the upper legs, particularly in thinner patients. In those cases, there was a higher percentage of disrupted fat cells leaving a larger oily fraction after centrifugation. Approximately two to three times more fat was harvested than the estimated amount required for the procedure. Fat was centrifuged for three minutes at the maximum speed of 3000 revolutions per minute (IEC MediSpin Centrifuge, Lewis-Clark State College, Lewiston, Idaho), after which the oil layer (top) and serum/infiltrate layer (bottom) were drained away, preserving the preadipocyte-rich pellet.\textsuperscript{18}

Fat injection was performed in 1-mm aliquots with a short, curved Coleman cannula. Between 13 and 23 mL of fat was injected into the deep subcutaneous plane of each side of the face, except for the lower lid/tear trough region (where the injection was performed in the supraperiosteal/submuscular plane) and the temporal area (where the level of injection was above the superficial fascia of the temporal muscle). Lipofilling could be performed without difficulty in conjunction with a MACS lift, as the target zones for injection were outside the dissection area.

**Patient Groups**

After initial experience with 200 MACS lift procedures between 2000 and 2006, a formal study evaluating the effects of adding lipofilling to the MACS lift was initiated in 2006. Subsequently, two groups were defined: Group A included 50 patients who underwent MACS lifting only; Group B included patients treated with MACS lifting with adjuvant lipofilling performed simultaneously or within one year after the MACS lift. A minimal follow-up period of six months was required for inclusion, and patients could not have undergone any other facial surgical procedure during that time. The groups did not differ significantly in age, smoking habits, or average body mass index. The senior author (JCNW), who had extensive experience in facial cosmetic surgery and lipofilling before the trial, performed all procedures in both groups. All patients were treated with the technique described.

Pre- and postoperative photographs were collected from 16 patients (eight from each group) randomly selected by an independent statistician. The photos were divided into two sets, containing four cases from Group A and four cases from Group B. Members of two single-blinded panels were asked to evaluate frontal and three-quarter views of these patients, presented side by side. Figure 1 is an example of the photographs shown to the panel. No patient information was provided. One panel consisted of five plastic surgeons, the other of five medical students. Panel members were asked to individually assess the improvement shown in the postoperative photos and rank the results by placing the photos in a row from most to least improvement. Each ranked photo received a score ranging from one (for the least improvement) to eight (for the best improvement). Three aesthetic zones of the face were evaluated: Zone 1 represented the tear trough/nasojugal groove, Zone 2 the nasolabial crease, and Zone 3 the malar eminence (Figure 2). Representative clinical results from each group are shown in Figures 3 and 4.

**Statistical Analyses**

Scores derived from the panel rankings were summed and grouped according to the view and aesthetic zone.
Results of the photographic rankings by the panel members are shown in Table 1. The plastic surgeons ($P = .009$) and the medical students ($P = .01$) both found significant improvements in Zone 1 (tear trough/nasojugal groove) following surgery in Group B patients (those who underwent MACS with lipofilling). The nasolabial fold (Zone 2) did not show any significant difference in improvement between Groups A and B on the frontal view (surgeons: $P = .664$; students: $P = .335$). In the same region, the three-quarter view showed significant improvement according to only the medical student panel (students: $P = .003$; surgeons: $P = .10$). Lipofilling of the malar eminence demonstrated significantly improved results on three-quarter view, as rated by both panels (surgeons: $P = .001$; students: $P = .007$).

Discussion

Optimal rejuvenation of the aging face should involve repositioning of ptotic soft tissues, as well as correction of volume deficiency where present. Popularized by Coleman, lipofilling is being increasingly undertaken to augment soft tissues in aesthetic and reconstructive plastic surgery. The benefits of this technique include having a readily available and autologous source of permanent filler, simultaneous body contouring in the process of fat harvesting, relative ease of execution, negligible morbidity, low cost, and predictable and reliable results. In addition, unlike synthetic fillers, autologous fat has the ability to change in structure with the patient’s physiologic changes, and adverse reactions are extremely uncommon. Local improvements in skin quality at the graft location are another benefit of lipofilling and may add to satisfaction with the postoperative result. Recent investigations on multipotent adipocyte-derived stem cells may give thin patients the ability to benefit from lipofilling.

In this study, concurrent lipofilling improved the tear trough and malar eminence to a statistically-significant
Figure 3. (A, C, E, G, I) This 42-year-old woman presented for facial rejuvenation treatment. (B, D, F, H, J) Seven months after a MACS lift procedure performed alone, without concurrent lipofilling. This patient was part of Group A.
Figure 3. (continued) (A, C, E, G, I) This 42-year-old woman presented for facial rejuvenation treatment. (B, D, F, H, J) Seven months after a MACS lift procedure performed alone, without concurrent lipofilling. This patient was part of Group A.
degree when compared to MACS lift procedures alone. Surprisingly, filling of the nasolabial fold with a round-tipped cannula did not yield consistent improvements. Previous studies on fat graft survival in the nasolabial crease have shown good results compared to other facial target zones,5,27,28 which may be attributable to the rich vascularization of the maxillofacial region. Pontius and Williams reported that lipofilling in the nasolabial crease was an effective adjunct to procedures to lift the midface.2 Hypothesizing that our lack of effect might be a result of filling the nasolabial crease with a blunt cannula, we are currently investigating the value of pretreating this area with a sharper V-dissector instrument.

Despite the increasing number of favorable aesthetic outcomes shown in the literature,4 the lipofilling technique is still often plagued with uncertainties about its longevity and the unpredictability of fat cell survival.21,29 Although postoperative graft atrophy has been reported elsewhere,29,30 in our study there was no need for secondary lipofilling during the period of investigation. We believe that centrifugation before injection improves reproducibility and allows for better pretreatment quantification of the volumes needed for injection. Most authors would agree that the viability of the fat cells is affected by the manner in which the cells are harvested and processed,9,18,31-47 the rapidity and degree of revascularization of the transplanted fat cells,21,26,39 and the degree of fibrosis in the transplanted area.21,29,34,39,40 We found the follow-up period of 10.3 months in Group A and 10.9 months in Group B to be sufficient. Recent studies about fat cell survival34,41,42 suggest that major changes in volume after six months are highly unlikely due to the degree of cell organization34,42 and the deep vascularization34,42,43 of the graft. We concur with Kaufman et al29 that for further objectifying graft survival in humans modern volumetric imaging technology would be helpful.

The use of autologous angiogenesis promoters such as platelet-derived growth hormones,44 vascular endothelial growth factor,38,45 hypoxia-inducible factor 1,29,46 and insulin-like growth factor47,48 have shown promise in their ability to improve the viability of the fat grafts.43 These factors are released by platelets,49 which can be added to the fat graft in the form of platelet-rich plasma. It is possible that these new developments will improve short- and long-term results with lipotransfer by accelerating vascular ingrowth.42,50

In our nonrandomized retrospective study, all patients with loss of volume as a clear part of their aging process were offered the option during their first consultation of adding lipofilling to their MACS lift procedure. One can argue that results in this group were more significantly improved due to a possibly worse preoperative state (eg, a more evident loss of volume) in patients who elected to have lipofilling. However, even in cases where the loss is more subtle, volume deficiency is still a major contributing factor to the patient’s apparent facial age. Furthermore, there were certainly patients in the MACS-only group who would have benefited from lipofilling. We believe that this

Figure 3. (continued) (A, C, E, G, I) This 42-year-old woman presented for facial rejuvenation treatment. (B, D, F, H, J) Seven months after a MACS lift procedure performed alone, without concurrent lipofilling. This patient was part of Group A.
Figure 4. (A, C, E, G, I) This 60-year-old woman presented for facial rejuvenation treatment. (B, D, F, H, J) Six months after a MACS lift procedure with concurrent lipofilling. This patient was part of Group B.
Figure 4. (continued) (A, C, E, G, I) This 60-year-old woman presented for facial rejuvenation treatment. (B, D, F, H, J) Six months after a MACS lift procedure with concurrent lipofilling. This patient was part of Group B.
population is larger than previously anticipated. Defatta and Williams drew similar conclusions in their study.51

CONCLUSIONS

Results from this single-blinded panel evaluation of pre- and postoperative photographs comparing patients who underwent MACS lift procedures alone versus those who had concurrent lipofilling showed objective improvement with lipofilling. Our study demonstrates that lipofilling, which addresses volume loss in patients with facial aging, can significantly enhance the aesthetic outcome of MACS lifting, particularly in the tear trough and malar eminence regions.

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