Anatomic Predictors of Unsatisfactory Outcomes in Surgical Rejuvenation of the Midface

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**Objective:** To aid the aesthetic surgeon in midface analysis and selection of treatment plans offering the greatest likelihood of success in midface rejuvenation.

**Methods:** We performed a retrospective review of all patients who underwent surgical midface rejuvenation by a single surgeon. We recorded demographics, history, procedures, outcomes, and complications. Results of physical examination and photography were used to classify patients by volume loss, midface ptosis, skin elasticity, and skeletal anatomy. Outcome was determined by patient satisfaction at the 12-month follow-up; unsatisfactory results were further analyzed by a blinded independent expert with more than 15 years’ experience.

**Results:** We included 150 patients. Mean patient age was 51 years; 93.3% were women, and 20.7% had undergone previous procedures, including malar implants, autologous fat grafting, rhytidectomy, midface lift, and extended lower blepharoplasty. Multimodality treatment was used in 34.0%. Patient dissatisfaction was encountered in 14.0% of cases; the expert concurred in each case. Autologous fat grafting alone demonstrated the greatest propensity for dissatisfaction (4 of 12 cases [33%]). Rate of dissatisfaction was significantly higher with malar hypoplasia (41% vs 7%; P < .001) or loss of elasticity (16% vs 3%; P = .01) but was not highly correlated with age (r = 0.15).

**Conclusions:** Successful midface rejuvenation requires accurate diagnosis and avoidance of anatomic pitfalls. Many patients require multimodality therapy, including lifting and volumizing techniques. Unsatisfactory results are most common when midfacial aging is accompanied by skeletal insufficiency or loss of elasticity. Respective consideration of these defects should be given to placement of malar implants and rhytidectomy approaches targeting the midface.


**Cosmetic Consultation**

For the aging midface is among the most difficult in aesthetic facial surgery. The complex interplay of adipose tissue, mimetic musculature, osseocutaneous ligaments, and the overlying skin creates myriad patient-specific changes. In addition, genetic and anatomic differences present throughout life result in a wide age range at presentation. For some patients, obvious midfacial aging begins in the third decade of life, whereas for others the hallmark changes in this area begin only after menopause or as late as the sixth decade. A similar variety of treatments exists for midfacial aging, and patients have widely divergent desires and tolerate different levels of invasiveness. Signs of midfacial aging begin in the upper cheek as the suborbicularis oculi fat (SOOF) and malar fat pad begin to lose their youthful volume. This process is followed by ptosis of the adipose tissues, with concomitant development of the tear-trough deformity and show of the bony infraorbital rim. Further descent of the malar fat pad subsequently produces a deepening of the nasolabial fold, as the relatively thick cheek subunit abuts the thin, muscular perioral area. Later, with advancing age and hormonal changes, the facial retaining ligaments and overlying skin lose elasticity, thus augmenting midfacial ptosis and contributing to jowling in the lower face. Changes in facial fat compartments observed by aesthetic surgeons for years have recently been demonstrated quantitatively, as studies show descent of the tissue mass and overall volume loss.

A final consideration in the midface consultation is independent of patient age, that is, skeletal anatomy and malar projection. Particularly in milder cases, the fullness of the soft tissues of the youthful cheek can mask a deficiency of the underlying bony structure. As the attendant volume loss and midface ptosis advance with age, this structural deficit may become apparent and contribute significantly to observed changes. In more severe cases, however, malar hypoplasia or a negative vector may be the primary aesthetic concern and lead to relatively young patients seeking cosmetic intervention.
In this study, we performed a retrospective review of patients seeking cosmetic consultation primarily for midfacial aging and provide a quantitative analysis of 150 consecutive patients who underwent midfacial rejuvenation. To facilitate comparisons, we developed a classification system based on the major factors in midfacial aging. We then examined the success of midface rejuvenation at the 12-month follow-up according to this scheme, the specific procedures performed, and patient age. Finally, we present detailed analyses of cases resulting in patient dissatisfaction and attempt to derive some general principles that may help to improve results and promote greater patient satisfaction.

**METHODS**

**PATIENTS**

We performed a retrospective review of patients undergoing surgical procedures for midfacial aging. We reviewed all cosmetic consultations from January 1, 2007, through December 31, 2010, and selected patients seeking primarily midface rejuvenation for further evaluation. To be included in the present analyses, patients must have undergone preoperative consultation and had a minimum follow-up of 12 months. Demographics and medical history were recorded, with particular attention to previous aesthetic facial surgery. Patients seeking midface surgical rejuvenation could not have undergone injection of fillers for revolumization or ablative resurfacing (ie, carbon dioxide laser, dermabrasion, or medium to deep chemical peels) within 6 months of the date of their procedure. No such criteria were maintained for neurotoxins (ie, botulinum toxin) or nonablative resurfacing procedures (eg, superficial chemical peels). No other exclusion criteria were used.

All surgical procedures were performed by one of us (A.A.J.) at a private practice surgery center. Standardized photographs were taken preoperatively and during follow-up. All complications and any revision procedures were noted. Patient satisfaction was assessed at the 12-month follow-up visit. Dissatisfaction was defined by the patient’s desire for further midfacial treatment and, in these cases, required concordance with the primary surgeon’s evaluation of the midface result at 12 months.

Patient satisfaction was related exclusively to the midface result at 12 months and did not reflect specific postoperative issues, any delays in healing, or resolved complications. However, in all cases of patient dissatisfaction, paired, standardized preoperative and postoperative photographs were reviewed.
We found that, using this classification scheme, patients fit into 1 of 3 general categories (classes I, II, and III) based on the severity of midfacial aging (Figure 1). Furthermore, patients in each group could be subclassified as having normal skeletal anatomy (A) or a deficient skeletal projection in the midface (B). Finally, people age differently, with genetic and environmental factors contributing uniquely. Strict age-based classifications are thus inadequate. As such, age for each class is presented as a suggested range, although outliers exist in each group (Table 1).

### Table 1. Multifactorial Classification Scheme for Midface Aging

<table>
<thead>
<tr>
<th>Midface Classification</th>
<th>Intraorbital or Malar Volume Loss</th>
<th>Midface Ptsis</th>
<th>Loss of Elasticity</th>
<th>Negative Vector or Malar Hypoplasia</th>
<th>Age Category, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>&lt;40</td>
</tr>
<tr>
<td>IB</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>&lt;40</td>
</tr>
<tr>
<td>IIa</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>40-55</td>
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<tr>
<td>IIB</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>40-55</td>
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<tr>
<td>IIIa</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>&gt;55</td>
</tr>
<tr>
<td>IIIb</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>+</td>
<td>&gt;55</td>
</tr>
</tbody>
</table>

Abbreviations: minus sign, absent; plus sign, present; 2 plus signs, obvious or significant.

We used either of 2 implants (Conform Terino Malar Shells or Combined Submalar Shells; ImplanTech) for malar augmentation. Implants were placed exclusively via the transoral approach with a standard upper gingivobuccal sulcus incision and superorbital dissection.17 Implants were held in place with 2 transcutaneous sutures for 3 to 7 days postoperatively, when the sutures were removed.

### Extended Lower Blepharoplasty With Orbital Fat Transposition

Lower eyelid rejuvenation was approached with an extended blepharoplasty dissection according to the method outlined by Baker.15 Briefly, after elevation of a skin-muscle flap, dissection was carried on top of the SOOF over the face of the maxilla to the level of the infraorbital nerve. This procedure allowed for manipulation of the SOOF and provides a recipient site for transposed orbital fat. The orbital septum was incised along the infraorbital rim, permitting visualization and isolation of fat pockets. Excess fat in the lateral pocket was typically resected, improving the contour at the lateral canthus. Fat from the middle and nasal pockets was isolated, bluntly dissected, and rotated as pedicled grafts over the orbital rim to fill in the tear trough medially and improve the lower eyelid-cheek contour laterally.16

### Endoscopic Midface-Lift

We performed the endoscopic midface-lift (MFL) as previously described.22,23 Briefly, dissection began immediately on top of the deep temporal fascia overlying the temporalis muscle. At the zygomatic arch, the periosteum was incised and elevation was continued in a subperiosteal plane and below the masseteric tendon inferiorly. After release of the periosteum under the masseter and overlying the zygoma, the composite flap was resuspended in a superolateral direction to the temporoparietal fascia.12

### Deep-Plane Rhytidectomy

Deep-plane rhytidectomy followed from the basic concepts introduced by Hamra17,21,24 and Adamson et al.25 Our technique, however, extended the deep plane below the angle of the mandible into the upper neck (elevating the platysma off the underlying sternocleidomastoid process) and suspended the deep-plane flap in a vertical vector.26

SURGICAL PROCEDURES

**Autologous Fat Grafting**

Autologous fat grafting was performed in standard fashion according to the algorithm presented by Coleman.16 Periumbilical abdominal fat was used as the donor tissue in all but 1 case, in which lateral thigh fat was used. Approximately 80 mL of raw fat was harvested using a 2.1-mm cannula (Tulip SL; Tulip Medical, Inc). The fat was centrifuged, washed with injectable normal saline solution, and centrifuged a second time to isolate the adipose tissue. We used a 0.9-mm cannula (Tulip SL) for micrograft placement overlying the zygoma, in the submalar region, along the infraorbital rim, and at the nasojugal groove. A mean volume of 12 to 15 mL of processed fat was used per hemiface per case.

**Malar Implants**

We performed a modified endoscopic midface-lift (MFL) as previously described.22,23 Briefly, dissection began immediately on top of the deep temporal fascia overlying the temporalis muscle. At the zygomatic arch, the periosteum was incised and elevation was continued in a subperiosteal plane and below the masseteric tendon inferiorly. After release of the periosteum under the masseter and overlying the zygoma, the composite flap was resuspended in a superolateral direction to the temporoparietal fascia.

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STATISTICAL ANALYSIS

For continuous variables, we compared differences using independent-sample *t* tests. For comparisons of dissatisfaction rates between groups, we used the Fisher exact test for a $2 \times 2$ table. We assessed the relationship between the likelihood of dissatisfaction and patient age with the *r* coefficient. Two-tailed analyses were used in all cases, and statistical significance was set at $P < .05$. Calculations were performed using commercially available software (Excel; Microsoft Corp).

RESULTS

From 2007 through 2010, 150 patients underwent the procedures. Their mean age was 51 (range, 25-76) years; 93.3% of patients were female. Midface classification included 24 patients in class IA, 8 in class IB, 57 in class IIA, 16 in class IIB, 42 in class IIIA, and 3 in class IIIB. Demographic comparisons showed that class III patients were significantly older than class II patients ($P < .001$), and class II patients were significantly older than class I patients ($P < .001$) on average (Table 2).

Procedures performed included malar implants (2.7%), autologous fat grafting (21.3%), deep-plane rhytidectomy (32.0%), endoscopic MFL (32.7%), and extended lower blepharoplasty with orbital fat transposition (46.7%) (Table 3). Detailed history revealed that 20.7% of patients had undergone previous facial rejuvenation surgery elsewhere, with more than half of these in class II A. The most common prior procedure was superficial musculoaponeurotic system (SMAS) technique rhytidectomy (23 of 31 [74%]); of note, 14 of these patients (61%) underwent endoscopic MFL as part of their treatment plan for persistent midface ptosis.

At 12 months, no permanent facial nerve palsies occurred. One patient undergoing lower blepharoplasty had scleral show requiring lateral canthoplasty with a tarsal strip for correction. Two patients undergoing endoscopic MFL experienced wound infections; both were treated successfully with antibiotics in the outpatient setting. Three patients undergoing deep-plane rhytidectomy developed hematomas; one required operative intervention and the others underwent expectant management.

The overall dissatisfaction rate was 14.0%. Details regarding patient characteristics and procedures are presented in Table 2. Dissatisfaction rates differed significantly between patients with A and B subclassifications (41% vs 7%; $P < .001$). In addition, class IIIA patients had a significantly higher dissatisfaction rate than classes IA and II A patients (16% vs 3%; $P = .01$). No significant difference in dissatisfaction rates between the sexes was found, although a trend toward a higher dissatisfaction rate was found among men ($P = .15$). The dissatisfaction rate for patients with previous surgery was 16% (5 of 31); this rate did not differ significantly from those undergoing primary surgery (14%; $P = .53$).

Dissatisfaction rates by treatment plan are presented in Table 4. A multimodality approach was used in 34.0% of cases. The highest rates were seen in patients undergoing autologous fat grafting alone (4 of 12 [33%]), followed by combined extended lower blepharoplasty and MFL (5 of 20 [25%]) and combined endoscopic MFL and autologous fat grafting (1 of 4 [25%]). Dissatisfied patients in the latter 2 groups were all class III A. Other multimodality treatments exhibited a zero dissatisfaction rate. The likelihood of patient dissatisfaction was not highly correlated with age ($r = 0.15$; Table 5). In all cases in which the patients reported dissatisfaction at 12 months, the surgeon concurred with their assessment. Blinded, independent expert review of these cases resulted in a mean outcome score of 0.5; in no case was improvement rated as moderate or marked.

A review of consultation notes and executed treatment plans showed that 8 of 21 dissatisfied patients (38%) chose a surgical plan that differed from the recommend-
lying skeletal structure does not allow for adequate sup-

tinctions. First, skeletal insufficiency in the midface con-

mentioned significantly, regardless of approach, which is seen in each case. Strict age-based classifications or treat-

rate, including all major or minor secondary aesthetic procedures, was 3% (5 of 150).

Midfacial aging is complex and multifactorial, and cosmetic consultation for midface rejuvenation is thus the most difficult in aesthetic facial surgery. An accurate and complete diagnosis is crucial for surgical success, although the variety of procedures and approaches available can be overwhelming. In our study, 150 consecutive patients underwent surgical operations primarily for midfacial aging. To facilitate analysis, we created a classification scheme for the midface. Patient satisfaction at the 12-month follow-up was used as the primary outcome.

Overall, the rate of unsatisfactory results was 14%. The likelihood of patient dissatisfaction was not correlated with patient age ($r = 0.15$) (Table 5). As such, the age ranges included in our description of midface classes are not rigid; exceptions exist in all categories. Although obvious, we must remember that people age differently, with genetic and environmental factors contributing uniquely in each case. Strict age-based classifications or treatment choices, therefore, are inadequate and may lead to higher dissatisfaction rates.

Detailed examination of cases resulting in dissatisfaction according to midface anatomy reveals 2 important distinctions. First, skeletal insufficiency in the midface contributed significantly, regardless of approach, which is seen when comparing dissatisfaction rates among patients in classes B (41%) and A (7%). We believe a lack of underlying skeletal structure does not allow for adequate sup-

port of redraped soft tissue. Significantly improved aesthetic results in patients with a negative vector or a hypoplastic maxilla can be achieved with malar implants (Table 3).$^{6,10,11}$ Unfortunately, implants are underused in cosmetic facial surgery; we found this true in our study as well. From the patients’ perspective, many have an aversion to permanent implant materials or an unsubstanti-

 Second, loss of elasticity resulted in significantly higher dissatisfaction rates, as demonstrated in a comparison of class IIIA patients (16%) with classes IA and IIA patients (3%). Although a discussion of elasticity is often limited to studies of lower face and neck rejuvenation, the importance of this concept in the midface cannot be overstated. If preoperative examination reveals loose, drooping skin that does not return easily to the baseline position when stretched, elasticity is compromised and biologic creep will necessitate an excision-based treatment. This conclusion is apparent in our data as a 30% dissatisfaction rate of the endoscopic MFL, alone or in combination, when treating class III patients. Biological changes in the facial skin accompanying menopause likely play a significant role because decreased estrogen levels result in loss of elasticity.$^{8,9}$ Again, loss of elasticity helps to explain the significantly higher dissatisfaction rates in the class III patients; the mean age of this group was 61 years.

An analysis of dissatisfaction rates according to treatment protocol reveals interesting trends. Multimodality treatment was required to achieve the desired aesthetic goals in more than one-third of cases. Despite this finding, 2 combined treatment plans demonstrated relatively high dissatisfaction rates (25%): extended lower blepharoplasty with orbital fat transposition and endoscopic MFL and autologous fat grafting with endoscopic MFL. Careful review of the patients’ medical records and photographs again underlines the importance of skeletal structure and loss of elasticity because these cases represent problems of patient selection (class III or subclass B) rather than technical issues with the surgical procedures (Figure 2).

Following from this discussion is an examination of patients undergoing rejuvenation procedures in our series who had undergone previous rhytidectomy elsewhere and subsequently sought consultation for persistent midface concerns. In this subgroup, 23 of 31 (74%) had undergone SMAS face-lifts and required directed MFLs for correction; in 14 of these cases (61%), the procedure was an endoscopic MFL, whereas in the remain-

COMMENT

Abbreviation: MFL, midface-lift.

Table 4. Dissatisfaction Rates According to Procedure Performed

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Age, Mean, y</th>
<th>Dissatisfaction Rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single modality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autologous fat grafting</td>
<td>43</td>
<td>33</td>
</tr>
<tr>
<td>Malar implant</td>
<td>33</td>
<td>0</td>
</tr>
<tr>
<td>Endoscopic MFL</td>
<td>53</td>
<td>14</td>
</tr>
<tr>
<td>Extended lower blepharoplasty</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>Modified deep-plane face-lift</td>
<td>53</td>
<td>13</td>
</tr>
<tr>
<td>Multiple modality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extended lower blepharoplasty</td>
<td>34</td>
<td>0</td>
</tr>
<tr>
<td>and malar implant</td>
<td></td>
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<tr>
<td>Extended lower blepharoplasty</td>
<td>51</td>
<td>25</td>
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<tr>
<td>and endoscopic MFL</td>
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<tr>
<td>Extended lower blepharoplasty</td>
<td>56</td>
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<td>and deep-plane face-lift</td>
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<td>deep-plane face-lift</td>
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Table 5. Dissatisfaction Rates According to Age Category

<table>
<thead>
<tr>
<th>Age Decile, y</th>
<th>Dissatisfaction Rate, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40</td>
<td>1 (4)</td>
</tr>
<tr>
<td>40-49</td>
<td>3 (8)</td>
</tr>
<tr>
<td>50-59</td>
<td>11 (18)</td>
</tr>
<tr>
<td>60-69</td>
<td>5 (25)</td>
</tr>
<tr>
<td>&gt;70</td>
<td>1 (17)</td>
</tr>
<tr>
<td>All</td>
<td>21 (14)</td>
</tr>
</tbody>
</table>

a Assessed by patient satisfaction.
deep-plane technique. These data highlight the important point that standard rhytidectomy is designed to treat the neck and jowls but cannot provide adequate treatment to the aging midface. This population requires a rhytidectomy technique that addresses the ptotic midface specifically by releasing the ligamentous attachments overlying the zygoma and repositioning the malar fat pad (Figure 3). A variety of excellent options have been described, including the high-lateral SMAS lift, the minimal-access cranial suspension lift with a third suture, SMAS-ectomy or SMAS imbrication with addition of the finger-assisted malar elevation, and the deep-plane face-lift.

The highest dissatisfaction rate in our cohort was seen for autologous fat grafting alone (33%). Dissatisfaction rates were comparable for all other single-modality plans (0%-14%) (Table 4). A review of the literature reveals that these rates are to be expected. A recent large study of the longevity of fat grafts placed in the infraorbital and cheek areas has shown minimal results in more than two-thirds of patients after 3 years.16 Given these facts and our experience, we believe that autologous fat grafting alone is a poor option for most patients; rather, it should be reserved for young patients with good midface projection (classes IA and IIA) or used as an adjunct to more invasive surgical procedures for severely devolumized or subclass B patients.

Our data also show that significant improvement in the midface can be achieved by selecting the right operation for the lower lids (Figure 4). Rather than...
the classic transconjunctival approach with fat removal, we performed an extended skin-muscle flap blepharoplasty with transposition of the orbital fat.\(^{18}\) This operation uses the middle and nasal fat pockets to camouflage the infraorbital rim and fill in the tear-trough deformity while providing access for lateral canthus repositioning and SOOF lift, as indicated. This combination is extremely effective, especially in classes I and II patients, in whom the success rate was 92% (35 of 38) as a single modality.

A final point of discussion involves our analysis of surgeon recommendations and patient choices. In all cases resulting in dissatisfaction, we reviewed documentation of the cosmetic consult and compared proposals with the plans ultimately selected. In more than one-third of these cases, patients did not proceed with the consultation recommendation; in nearly two-thirds of these cases, patients chose a single modality from a multimodality plan, whereas in the remainder, a procedure that was not part of the consultation plan was chosen. Many factors are at work in decisions about aesthetic surgery, including input and bias from friends, family, culture, and popular media. Some patients also have an irrational or incompletely articulated bias for or against certain approaches, incisions, or materials (eg, a preference for autologous fat or against facial implants). Cost also plays a significant role for most patients and may explain many of the cases in which partial plans were executed. We hope that the honest presentation of our data in this study will assist aesthetic surgeons in critical conversations with patients and result in selection of the best plan possible.

The ultimate measure of success in aesthetic surgery is necessarily patient satisfaction. Given the length of the healing process and to avoid recall bias, we chose 12 months as an appropriate end point.\(^{35,36}\) Our dissatisfaction rate was 4% using this metric. The revision rate was only 3%. Therefore, more than 75% of patients reporting dissatisfaction did not pursue revision. In our practice, we customarily provide revisions for free or at significantly reduced cost, so financial considerations were unlikely to be the primary factor in patients not pursuing revision surgery.

Using the data from our cohort of 150 consecutive patients, we have designed an algorithm to be used in midface cosmetic consultation (Figure 5). This flow-chart will assist in selecting a plan with the highest likelihood of success. Further, it affords a customized and integrated approach to the midface, customized in that the surgical plan is based on patient-specific anatomy, not just age or preferred procedures, and integrated in that the plan takes into account the mid-
Achieving long-lasting and natural-appearing midface rejuvenation requires accurate diagnosis and a broad surgical armamentarium. Many patients will require a multimodality approach. Dissatisfaction is most common in cases where midfacial aging is accompanied by skeletal insufficiency or severe loss of elasticity. The former group should receive consideration of more frequent use of malar implants, whereas the latter group benefits from a rhytidectomy approach that targets the midface. Although different combinations of procedures or techniques may work better in different hands, for different populations, or in different climates, the midface classification scheme presented herein is a valuable tool. Having the right discussion with the patient and choosing the best rejuvenation plan will help maximize patient satisfaction.

CONCLUSIONS

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Conflict of Interest Disclosures: None reported.

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Additional Contributions: Dan Becker, MD, contributed time and assistance as a blinded reviewer of patient data.

REFERENCES


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