Clinical Evaluation of 225 Sub-SMAS Facelifts with No Temporal Incision

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Background: Despite their name, "short scar" procedures leave scars in the temples and the postauricular scar often requires extension. Redraping the orbicularis muscle for periorbital rejuvenation increases the risk of facial nerve injury. This retrospective cohort study was undertaken to clinically evaluate a surgical approach that eliminates the temporal incision.

Methods: A sub-superficial musculoaponeurotic system (SMAS) facelift was used, incorporating a triple-vector platysmaplasty and fat injection for periorbital rejuvenation. From 2009 to 2019, 225 consecutive outpatients underwent a sub-SMAS facelift with a triple-vector (superior, lateral, medial) platysmaplasty, either alone or in combination with fat injection, laser resurfacing, blepharoplasties, endoscopic forehead lift, and other cosmetic procedures. Release of the retaining ligaments optimized SMAS mobilization. A temporal incision was not used. Fat (mean volume 32 ml) was injected into the undissected subcutaneous tissue plane. The mean follow-up time was 28 months.

Results: The most frequent complication was a neuropraxia (7.6%), usually affecting a frontal nerve branch, and always temporary. Two deep venous thromboses were detected by ultrasound surveillance. No significant correlation was detected between complications and age, sex, body mass index, smoking history, or a previous facelift. Sixteen patients (7%) returned for a secondary facelift (mean interval, 3.5 years).

Conclusions: A sub-SMAS facelift and triple-vector platysmaplasty with fat injection combine effective neckline rejuvenation with facial volume restoration. Avoiding a temporal incision eliminates a telltale scar. Orbicularis preservation avoids additional dissection, possibly reducing the risk of neuropraxia. Fat injection provides a net increase in facial volume. Long-term measurement studies are recommended. *(Plast Reconstr Surg Glob Open 2020;8:e2640; doi: 10.1097/GOX.0000000000002640; Published online 26 February 2020.)*

INTRODUCTION

In an effort to reduce recovery time and complications, many plastic surgeons have adopted facelift methods that use shorter incisions, such as the short-scar facelift and the Minimal Access Cranial Suspension (MACS) lift.[1,2] These modifications have focused on reducing the length of the postauricular scar. The author's modification eliminates the temporal scar, which can be a telltale sign of a facelift.

Orbicularis oculi redraping is a well-known and effective method to provide periorbital rejuvenation.[3] However, temporary neuropathies of the frontal and zygomatic branches of the facial nerve are occasional problems.[4,5] In an effort to reduce the frequency of this complication, the author eliminated orbicularis transposition, relying instead on fat injection for periorbital rejuvenation.

To maximize results in the lower face and neck, the author utilizes a triple-vector platysmaplasty, with an upward vector in the face, a lateral vector in the lateral neck, and a medial vector at the neck midline.[6] This study was undertaken to obtain clinical data for patients treated with the same sub-superficial musculoaponeurotic system (SMAS) facelift technique and no temporal incision, including complication rates and revisions, and compare patient groups that also received ancillary cosmetic procedures.

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PATIENTS AND METHODS

Patients

A retrospective cohort study was undertaken, clinically evaluating 225 consecutive patients treated from January 2009 to September 2019 with a sub-superficial musculo-aponeurotic system uniplanar facelift, triple-vector platysmaplasty, and no temporal incision. Patients were divided into 4 treatment groups[4,5] for evaluation (Table 1). These groups included facelift alone; facelift with blepharo-plasties; facelift and an endoscopic forehead lift; facelift, blepharoplasties and forehead lift; and a combined group. An exemption from Institutional Review Board oversight was obtained from Advarra IRB (Columbia, Md.).

Surgery

All surgery was performed by the author at the Surgery Center of Leawood, Kans., a state-licensed ambulatory surgery center. All patients underwent a sub-SMAS facelift (Figs. 1–3). The SMAS was divided just superior to the level of the zygomatic arch. The horizontal incision was about 3 cm long. The zygomatic[7] and masseteric[8] cutaneous retaining ligaments were released and the SMAS flap was transposed superiorly. This vertical vector, elevating the SMAS and platysma, was Vector 1. (**See Video 1,**

[online], which demonstrates the facelift dissection.) No temporal incision was used. The "temple roll" was allowed to settle spontaneously (Fig. 4). Simultaneous cosmetic surgery of the breast or body was performed in 24% of patients. Commercial products are listed in Table 2.

The elevated SMAS was fixed superiorly to the deep temporalis fascia. The platysma was plicated laterally to the sternomastoid fascia without elevation. Next, submental liposuction was performed, with interplatysmal fat resection and a medial corset platysmaplasty[9] (Fig. 3). (**See Video 2, [online],** which demonstrates Vector 2, the lateral platysmaplasty and Vector 3, the medial platysmaplasty.) Liposuction was performed conservatively using a single-hole 4 mm spatula-tipped cannula with the hole aimed deeply, away from the skin. In patients with full necks this procedure assisted with debulking the neck. In leaner patients or those patients who had previous submental liposuction, this method helped to develop the tissue planes and expose the platysma borders. Interplaytsmal fat was removed by direct fat excision using scissors. The submandibular glands were not resected.

After the facelift and cervicoplasty were completed, fat was injected into the undissected subcutaneous tissue layer between the SMAS and the skin. (**See Video 3, [online],** which demonstrates fat harvesting and injection.)

Table 1. Patient Data*

|	Facelift Only (%)	Facelift + Blepharoplasty (%)	Facelift + Forehead Lift (%)	Facelift + Blepharoplasty + Forehead Lift (%)	All Procedures (%)	P
No. patients	91	50	31	53	225	
Age, y						
Mean	59.7	58.3	60.3	58.3	59.1	NS
Range	41 – 79	42 – 79	46 – 77	43 – 78	41 – 79	
Follow-up time, mo						
Mean	28.4	30.8	26.7	24.7	28.1	NS
Range	0.2 – 147.2	0.2 – 150.5	0.4 – 141.6	0.2 – 120.1	0.2 – 150.5	
Sex						
Female	80 (87.9)	42 (84.0)	26 (83.9)	49 (92.5)	197 (87.6)	NS
Male	11 (12.1)	8 (16.0)	5 (16.1)	4 (7.5)	28 (12.4)	
Smoking status						
Nonsmoker	84 (92.3)	46 (92.0)	26 (83.9)	43 (81.1)	199 (88.4)	NS
Smoker	7 (7.7)	4 (8.0)	5 (16.1)	10 (18.9)	26 (11.6)	
Previous facelift						
No	52 (57.1)	34 (68.0)	21 (67.7)	46 (86.8)	153 (68.0)	NS
Yes	39 (42.9)	16 (32.0)	10 (32.3)	7 (13.2)	72 (32.0)	
BMI, kg/m²						
Mean	23.8	25.3	24.7	25.2	24.6	NS
Range	15.8 – 38.6	15.6 – 37.2	17.4 – 37.6	15.9 – 38.6	15.6 – 38.6	
Fat injection						
No	40 (44.0)	13 (26.0)	8 (25.8)	2 (3.8)	63 (28.0)	<0.001†
Yes	51 (56.0)	37 (74.0)	23 (74.2)	51 (96.2)	162 (72.0)	
Fat volume, ml						
Mean	28.2	27.1	36.5	38.2	32.2	NS
Range	3.0 – 70.0	4.0 – 49.5	15.0 – 57.5	17.0 – 66.0	3.0 – 70.0	
Laser resurfacing						
No	53 (58.2)	25 (50.0)	12 (38.7)	11 (20.8)	101 (44.9)	<0.001‡
Yes	38 (41.8)	25 (50.0)	19 (61.3)	42 (79.2)	124 (55.1)	
Chin implant						
No	80 (87.9)	40 (80.0)	24 (77.4)	41 (77.4)	185 (82.2)	NS
Yes	11 (12.1)	10 (20.0)	7 (22.6)	12 (22.6)	40 (17.8)	
Rhinoplasty						
No	87 (95.6)	48 (96.0)	28 (90.3)	49 (92.5)	212 (94.2)	NS
Yes	4 (4.4)	2 (4.0)	3 (9.7)	4 (7.5)	13 (5.8)	

NS, not significant; BMI, body mass index.

*Means were compared across procedure groups using one-way analyses of variance. Chi-square goodness of fit tests were used to compare percentages across procedure groups for categorical variables.

†Patients treated with a facelift, blepharoplasties, and a forehead lift were more likely to have simultaneous fat injection than patients having a facelift without these other procedures.

‡More patients in the facelift, blepharoplasty, and forehead lift group elected to have laser resurfacing than patients undergoing a facelift or facelift and blepharoplasties.
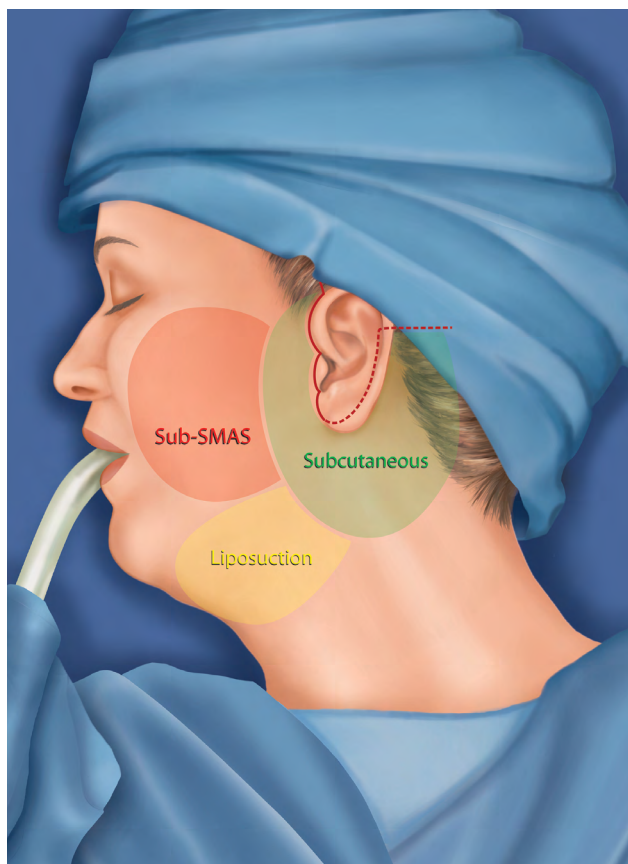
Fig. 1. The facelift incision is marked. This incision "hugs" the tragus in front of the ear and courses on the back of the ear just above the postauricular crease (*dotted line*). The incision turns at a right angle and continues horizontally into the hairline. Liposuction is performed over the lateral neck (*yellow*). The SMAS and skin are elevated as 1 layer in the cheek (*magenta*). Skin undermining is minimized (*green*). Adapted with permission from *Plast Reconstr Surg Glob Open* 2015;3:e484, with permission from Wolters Kluwer Health, Inc..
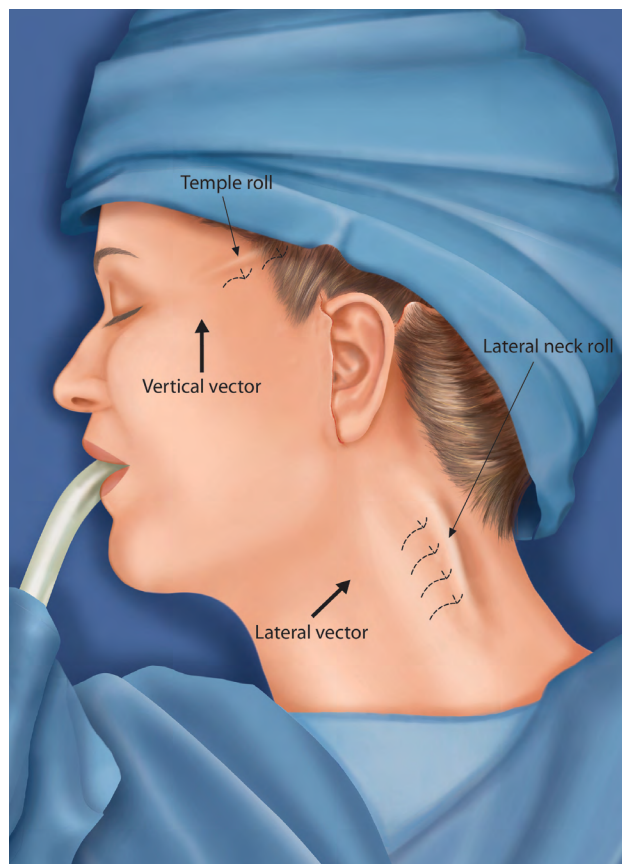
Fig. 2. Diagram illustrating the placement of sutures used to fix the elevated SMAS to the deep temporalis fascia, which also advances the platysma vertically, accomplishing the first vector of a triple-vector platysmaplasty. A lateral platysmaplasty provides the second vector, with musculocutaneous advancement of the cervical flap.

Endoscopic forehead lifts were performed using absorbable suspension screws. (**See Video 4, [online],** which demonstrates the endoscopic forehead lift.) Drains were removed the morning after surgery. No dressings were used.

Beginning in 2013, all patients were monitored for deep venous thromboses using ultrasound surveillance. This practice was adopted for all adult patients undergoing surgery under total intravenous anesthesia by the author, not just facelift patients or study patients.[10] Scans were performed in the office before surgery, the day after surgery, and ~1 week after surgery.[10] Sequential compression devices were applied routinely until 2016, when they were discontinued. A contemporaneous clinical study and laboratory study failed to support their efficacy.[10,11] Patients were treated using total intravenous anesthesia without muscle relaxation. A laryngeal mask airway was used.

Statistical Analysis

Statistical analyses were performed using IBM SPSS for Windows version 21.0 (SPSS, IBM Corp. Armonk, N.Y.). One-way analysis of variance was used to compare means for continuously measured variables. Pearson's Chi-Square

was used to compare frequencies for categorical variables. Correlations were tested using Pearson correlations. A value of $P < 0.01$ was considered significant.

RESULTS

The mean follow-up time was 28 months. Comparisons of the procedure groups revealed no significant difference in age, follow-up time, sex, smoking status, secondary surgery, or body mass index (Table 1).

Complications

Two women developed asymptomatic deep venous thromboses, detected on routine Doppler ultrasound scans the day after surgery in 1 patient and 6 days postoperatively in the other patient. Both were distal thromboses affecting the right posterior tibial veins and both were treated with oral anticoagulation, resolving in 3 weeks and 6 weeks respectively, as documented on follow-up scans.[10]

The most frequent complication was a temporary neuropraxia (7.6%) (Table 3). No patient sustained a mandibular branch neuropraxia. No patient developed clinically evident cyst formation, embolic phenomena, or fat necrosis after fat injection.

Fig. 3. Illustration of third vector. After submental liposuction and conservative interplatysmal fat resection, the platysma is plicated in the midline with a running 4-0 Monocryl (Ethicon, Somerville, N.J.) suture.

Persistent jowls or skin laxity requiring re-treatment during the study period were counted as complications. Twenty-one patients (9.3%) underwent additional surgery under total intravenous anesthesia defined as a "reoperation," to treat persistent jowls, brow ptosis, or submental fullness (Table 3). The mean time interval between the original surgery and a secondary facelift for persistent jowls was 3.5 years. There were no significant differences between the 4 groups in frequency of complications. No significant correlations were detected between complications and age, sex, body mass index, smoking history, or previous facelift surgery.

DISCUSSION

Orbicularis Preservation

Redraping the orbicularis oculi muscle is a well-known method of periorbital rejuvenation.[3–5,12] Although effective, this procedure can occasionally cause lower lid retraction.[13] Injury to the orbicularis branches of the zygomatic branch of the facial nerve can occur.[14,15] Orbicularis preservation and fat grafting offer a safer alternative.[13]

Uniplanar Vertical Vector Sub-SMAS Plane Facelift

Inspired by the work of Skoog,[16] who first incorporated a deeper tissue level in his facelifts, plastic surgeons in the 1980s and 1990s began performing sub-superficial musculoaponeurotic system ("sub-SMAS" or "deep-plane") facelifts.[3,17,18] Tension is applied to the SMAS, which is relatively strong and unlikely to stretch,[19,20] avoiding traction on the skin. By releasing and repositioning the SMAS, all 3 layers of the midface—connective tissue, fat, and skin—are elevated.[3,17,18]
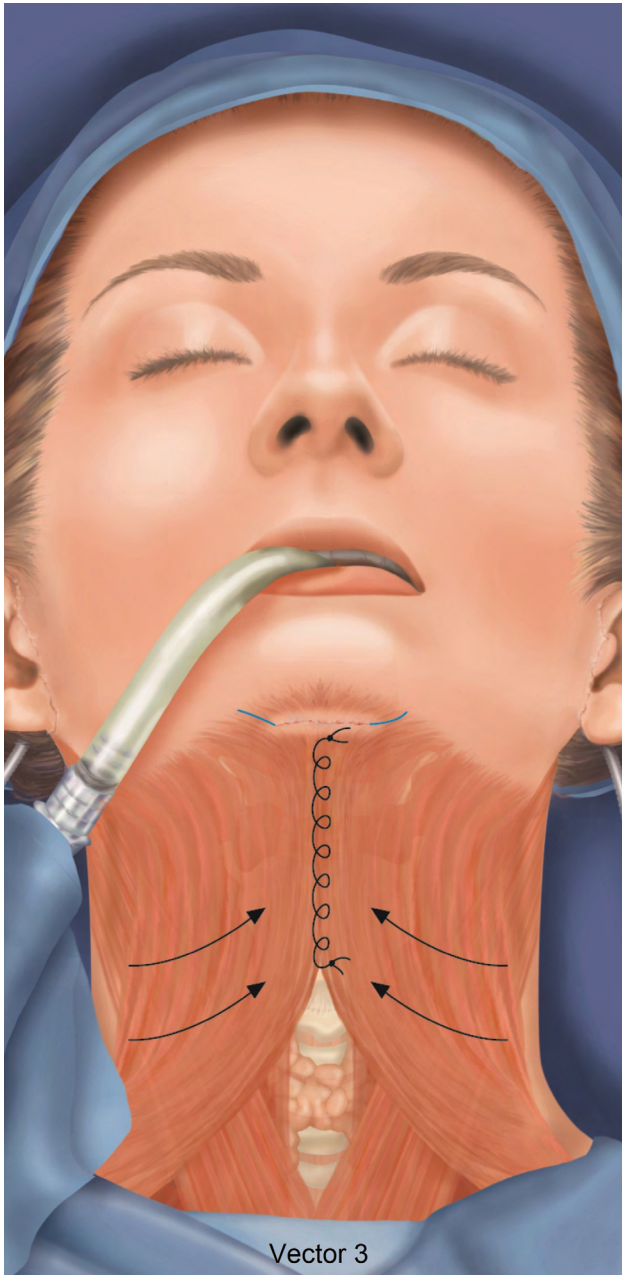
A sub-SMAS dissection with minimal skin undermining preserves the integrity of the subcutaneous layer between the skin and SMAS, theoretically optimizing survival of injected fat (Figs. 5 and 6). Preservation of this tissue plane is only possible using a single vertical vector. A separate vector for the skin and the SMAS[21] necessitates dissection in the subcutaneous plane, creating a new dead space. A supra-SMAS dissection[22] would be expected to compromise the vascularity of this plane, and therefore reduce fat take, which depends on close approximation of injected fat to vascularized tissue.[23–26]

After transposition, the fascial tissue planes are directly approximated with sutures. These are not suspension sutures, which are prone to cheese-wiring.[27] The more distal the site of fixation from the tissue being elevated, the less reliable the lift and the greater the risk of relapse.[12,28] Large-caliber, permanent sutures, featured in minilifts as compensation for lack of tissue mobilization,[2] are unlikely to hold and can cause persistent tender lumps. The soft tissues tend to morph around the sutures regardless of their caliber; surgeons invariably find them loose in the tissues at the time of subsequent surgery.[27] Without deep tissue release, the treatment of the jowls may be less effective.[29] Procedures that rely on skin tightening can produce an unnatural appearance (eg, lateral sweep, pixie ear deformity) if deeper tissues remain ptotic.[30,31]

Release of the Retaining Ligaments

The rationale for release of the SMAS retaining ligaments has been questioned.[32] When a patient looks in the mirror and pulls up on her facial skin, she is certainly not releasing her retaining ligaments; yet she can correct the tissue descent with this "finger lift."[2] Why, then, should a plastic surgeon release the retaining ligaments when this maneuver would appear to be unnecessary to successfully reposition the tissues?

Of course, there is no external surgical option; an internal mechanism is needed to provide lift. Moreover, the ligamentous weakness is not at the sub-SMAS level, but at a level between the SMAS and skin. The sub-SMAS

Fig. 4. Frontal and lateral photographs of a 47-year-old woman treated with a sub-SMAS facelift, upper and lower blepharoplasties, submental lipectomy, fat injection (30 ml), periorbital erbium:YAG laser skin resurfacing, pulsed dye laser treatment of veins of face and neck, and tip rhinoplasty. She is shown before (A,D), 10 days after surgery (B,E), and 3 months postoperatively (C,F). The lateral view demonstrates the temporary temple roll created by the vertical lift, which is still visible 10 days after surgery but has resolved well before her 3-month follow-up visit. The patient is not wearing makeup.

Table 2. Commercial Products Used

	Product	Manufacturer	Headquarters
SMAS, platysma, galea sutures	4-0 PDS, 4-0 Monocryl	Ethicon, Inc.	Somerville, N.J.
Pinch-activated electrocautery	Potts-Smith monopolar, insulated, serrated, 2.0 mm handswitch cautery forceps	Kirwan Surgical Products, Inc.	Marshfield, Mass.
Chin augmentation	Mittelman Pre Jowl-Chin silicone implant	Implantech Associates, Inc.	Ventura, Calif.
Fat harvesting	Lipivage	Genesis Biosystems, Inc.	Lewisville, Tx.
Fat injection	Coleman cannulae	Mentor Corp.	Santa Barbara, Calif.
Forehead fixation	2.0 X 5.0mm LactoSorb suspension screws	W. Lorenz Surgical, Inc.	Jacksonville, Fl.
Carbon dioxide laser	Ultrapulse	Lumenis Aesthetic Inc.	Santa Clara, Calif.
	Unipulse	Nidek Inc.	Fremont, Calif.
Erbium:YAG laser	Skinlight erbium:yttrium-aluminum-garnet laser	Candela Laser Corp.	Wayland, Mass.

ligaments have not really been stretched out. Their more superficial branches, which are fine terminal extensions that arborize in the superficial fibrofatty layer,[29] have weakened, allowing tissue relaxation and descent.[30] Skin tightening is inadequate to correct jowls because of its elasticity and its inability to provide much traction on the deeper tissues.[30] Simply performing a SMAS plication without release of the retaining ligaments cannot be expected to provide much vertical movement of the superficial tissues,[28,33] because these ligaments are quite strong (often making an audible snap when released). The reason they require release is not because they have weakened, but

because the *superficial* terminal branches are attenuated. Only by elevating the SMAS can the distention of these terminal ligaments be overcome, in effect overelevating the SMAS in doing so,[34] with assistance from fat injection to radially fill out the tissues (Fig. 7).[26,35] Granted, it does seem contraintuitive to release a strong structure such as the retaining ligaments with a view to correcting the problems caused by its weak terminal extensions. Importantly, a vertical lift has a logical basis for avoiding long-term negative operative sequelae.[36]

Even such a major upward mobilization of the SMAS cannot always correct jowls in 1 operation.[37] In this

Table 3. Complications

	Facelift Only (%)	Facelift + Blepharoplasty (%)	Facelift + Forehead lift (%)	Facelift + Blepharoplasty + Forehead Lift (%)	All Procedures(%)	P
No. patients	91	50	31	53	225	
Complications						
No	66 (72.5)	29 (58.0)	19 (61.3)	36 (67.9)	150 (66.7)	NS
Yes	25 (27.5)	21 (42.0)	12 (38.7)	17 (32.1)	75 (33.3)*	
Deep venous thrombosis	0	0	2	0	2	
Neuropraxia						
Frontal	3	2	1	2	8	
Buccal	2	2	1	1	6	
Zygomatic	1	2	0	0	3	
Total					17 (7.6)	
Scar deformity						
Facelift	4	2	1	1	8	
Forehead lift	0	0	1	1	2	
Persistent skin laxity						
Face	8	4	2	2	16	
Eyelids	0	2	1	1	4	
Seroma	4	2	1	1	8	
Hematoma	3	2	1	2	8	
Malar edema	0	2	2	1	5	
Persistent neck pleat	0	3	1	1	5	
Delayed wound healing	0	0	1	2	3	
Infection	0	1	0	2	3	
Persistent submental adiposity	2	0	0	1	3	
Persistent brow ptosis	0	0	0	3	3	
Total complications	27	24	15	21	87	
Reoperations – intravenous sedation						
Secondary facelift	8	4	2	2	16 NS	
Secondary forehead lift	0	0	0	3	3	
Secondary submental lipectomy	1	0	0	1	2	
Total reoperations	9	4	2	6	21 (9.3)	
Revisions – local anesthesia only						
Seroma drainage	4	2	1	1	8	
Facelift scar revision	4	2	1	1	8	
Evacuation of hematoma	3	2	1	2	8	
Excision of neck pleat	0	3	1	0	4	
Forehead lift scar revision	0	0	1	1	2	
Removal of infected chin implant	0	0	0	1	1	
Total revisions	11	9	5	6	25 (11.1)†	

NS, not significant.

*Twelve patients had 2 complications each. Therefore, the total number of complications exceeds the number of patients who had complications.

†Six patients had 2 revisions each. Therefore, the number of revisions exceeds the number of patients who had revisions.

series, 7% of patients returned for a secondary facelift to address persistent jowls and skin laxity, similar to the experience of Rawlani and Mustoe[37] (6.3%). Patients should be informed of the possibility of a second operation so that they do not interpret persistent jowls as a surgical failure.[38]

The use of electrocautery in the face is avoided because of its potential to cause nerve injury.[39] Using the scissor spreading technique, small facial vessels tend to be avulsed and stop bleeding spontaneously.

Eliminating the Temporal Incision

A temporal incision is included in most facelift methods. This scar often heals well and is inconspicuous. A vertical incision that extends upward into the scalp avoids a hairline incision but can displace the hairline by removing hair-bearing skin within the sideburn.[40] Hairline incisions avoid sideburn elevation but may be more visible.[40] Despite their names, the "minimal access" MACS lift, short-scar facelift, and many "mini-facelifts" may include a lengthy incision in the temple that is often hidden by hair in published photographs.[2,41] In some patients, this scar may be objectionable, and patients may be self-conscious about wearing their hair up or back (Fig. 8).

Eliminating the temporal incision, where the scar may be exposed, may be more helpful than behind the ear, where the scar is usually well-concealed. The authors of both short-scar techniques recognize that a retroauricular extension is often required to adequately treat the neck.[1,41]

The importance of preserving a sideburn is well-recognized.[42] Perhaps surprisingly, the temple roll, caused by the upward movement of facial tissue, typically flattens over a period of <2 months (Fig. 4), similar to the temporary skin pleats after an abdominoplasty or excess nasal skin after rhinoplasty. This method does involve a trade-off—a temporary temple roll of redundant skin versus a scar. However, in the author's experience, patients accept this temporary "speed bump" (usually easily hidden by hair) as a favorable trade for a permanent hairline scar. The hairline is not displaced. Women can wear their hair up and back, exposing their ears, without worrying about exposed scars (Figs. 4–6).

Avoiding a temporal scar is particularly advantageous in men with short hair or baldness (Fig. 9). With this modification, patient-reported scar dissatisfaction is only 2.2%.[4] A tragal deformity is avoided by using a pretragal incision. The incision "hugs" the base of the tragus to avoid a noticeable anteriorly displaced scar.

Fig. 5. This 51-year-old woman is shown before (A,C) and 2 years after (B,D) a sub-SMAS facelift, upper and lower blepharoplasties, submental lipectomy, fat injection (18 ml), CO_2 laser skin resurfacing, endoscopic forehead lift, and a tip rhinoplasty. Her right malar projection increased 4 mm. Photographs are matched for size and orientation using the Canfield Mirror 7.4.1 imaging system (Canfield Scientific Inc., Fairfield, N.J.). The patient is not wearing makeup.

A reasonable question for a plastic surgeon considering this method is whether avoiding a temporal incision limits the surgical exposure, possibly increasing the risk of nerve injury. Indeed, the surgical exposure needed for orbicularis redraping is reduced. However, the adoption of lipofilling for midface rejuvenation obviates the need for periorbital exposure and dissection. The lateral orbital thickening is preserved intact (Fig. 7).

Fat Injection

Volume restoration with fat is an important component of facial rejuvenation,[5,20,23,24,29,32,35,40,43,44] and is used by >85% of surveyed plastic surgeons.[44] Malar fat suspension is still emphasized for midface rejuvenation in recent review articles,[31,45] although there is a lack of supportive measurements to demonstrate efficacy.[46] Buccal fat pad transposition has also been promoted to

Fig. 6. Right oblique photographs of a 52-year-old woman treated with a sub-SMAS facelift, upper blepharoplasties, submental lipectomy, fat injection (30 ml), carbon dioxide laser skin resurfacing, and chin augmentation with an implant. She is shown before (A), 1 month after surgery (B), and 6 months after surgery (C). Malar projection is increased at 1 month, with no change at 6 months. There is now a pleasing ogee curve created by the combination of the facelift, fat injection, and chin augmentation (C). The tear trough has been eliminated and the dark circles are improved. A nevus was removed from the right jawline, leaving a small scar. Photographs are matched for size and orientation. The patient is not wearing makeup.

augment malar volume.[47] However, measurements of malar projection on standardized photographs reveal no net increase.[48] Any benefit is likely to be negligible in view of the small amount of fat available for transposition (~5 ml)[49] and the expected attenuation by suturing.[35,48] Only malar fat injection has been shown to provide a lasting increase in malar volume in facelift patients.[35,43] Measurements reveal that malar augmentation at 1 month is likely to persist, attesting to the viability of transplanted fat (Fig. 6).[35]

Fat is harvested after the facelift and injected immediately. Placing the fat superficial to the SMAS avoids an overlying compressive force.[48] The injected fat camouflages any flattening effect that may result from SMAS elevation and fixation.[21] Although many operators inject fat at the beginning of the procedure,[40] the author prefers to harvest and inject fat *after* the facelift. This sequence allows no opportunity for subsequently opening the tissue plane and releasing fat. The facial tissues have already been elevated, making fat placement more accurate.

The "macro" fat injection technique calls for volumes of ~1 ml of fat injected under low pressure with each withdrawal stroke of the (blunt-tipped) cannula, paralleling the orbital rim in the cheek, and is typically accomplished in <30 minutes, including fat harvesting. Traditional micro-injection[26] requires hundreds of strokes of the cannula, possibly exacerbating tissue trauma and swelling, and increasing the operating time. The efficacy of fat macroinjection in the cheek has been demonstrated in serial magnetic resonance images,[35] and in standardized photographs that show a sustained increase in malar projection (Fig. 6). Shear stress[50] is minimized by using a cannula with a sufficiently large internal diameter (1.2 mm), and by limiting the injection rate to ~1 ml/s.

Fat injection into the subcutaneous plane, which has been pre-injected with a local anesthetic solution containing epinephrine, ensures that any blood vessels are small and constricted. The author has not encountered embolic phenomena from fat injection. Because there is naturally no subcutaneous tissue superficial to the orbicularis oculi and orbicularis oris muscles, fat injection in these areas is immediately submuscular, not subcutaneous. Attempts at more superficial injection may produce noticeable bumps.[22]

Although concern has been raised about the possibility of fat hypertrophy with subsequent patient weight gain, causing a cherubic facial appearance,[51,52] the author has

DEEP PLANE FACELIFT + FAT INJECTION
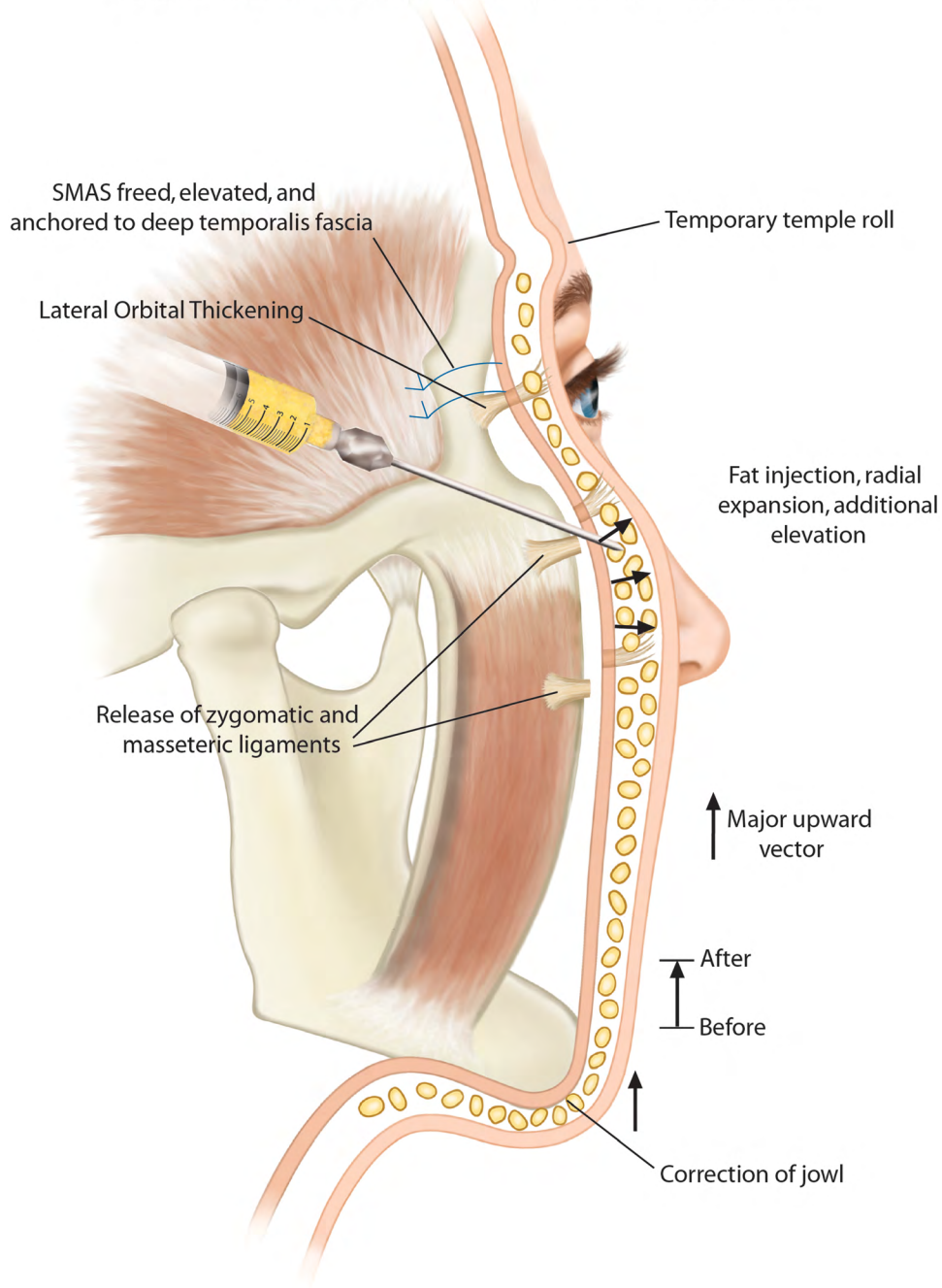
Fig. 7. The sub-SMAS lift releases the SMAS from its ligamentous attachments, allowing it to be elevated along with the skin and fat sandwiched in between. This release allows greater mobility of the tissue and removes tension from the skin, placing it on the less-elastic SMAS layer instead. The sub-SMAS dissection also preserves the integrity of the subcutaneous layer between the skin and SMAS, optimizing survival of injected fat. Fat is injected into the undisturbed plane between the skin and SMAS, providing outward (radial) expansion of the cheek. This volume replacement restores fuller, rounder cheeks. Other areas of the face are injected simultaneously.

not observed such an undesirable result using a mean fat injection volume of about 30 ml. Nasolabial creases that are ineffectively treated with SMAS elevation alone[29,53] respond favorably to fat injection (Fig. 5).[26,40,43,44]

Triple-Vector Platysmaplasty

Maximum tightening of the platysma takes place in 3 vectors—superior, lateral, and medial. Although only 1 vector is used at the time of an isolated submental

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Fig. 8. This 63-year-old woman underwent a "mini-facelift" elsewhere 4 years previously. She was unhappy with the scar and was not comfortable wearing her hair up or back.

lipectomy, all 3 vectors may be used at the time of a facelift combined with an open neck dissection. Omitting a medial platysmaplasty increases the risk of persistent platysmal bands.[54] The author's technique differs from a traditional sequence in that the facelift (Vector 1) is performed first, allowing unrestricted upward mobility of the SMAS, which is in continuity with the platysma.[55]

The lateral platysmaplasty fits with the familiar philosophy of tightening the muscle/connective tissue layer under the skin and using this repair to advance the overlying skin (Fig. 2), rather than relying on skin tension alone, which is prone to stretching over time.[19] Although some surgeons believe that an open approach to the neck increases the risk of complications,[56] open neck dissection (Fig. 3) has received renewed interest.[4,5,40,54] The midline fascia is notoriously loose in many patients (the culprit in the turkey wattle deformity), and is unlikely to tighten sufficiently with lateral traction alone. An open neck approach allows exposure of the interplatysmal fat and direct resection of excess fat, when present. It is essential to avoid overresection of submental fat,[54] which might cause an unattractive "cobra-neck" deformity.

Open procedures are not necessarily riskier. On the contrary, there is a tendency for inexperienced operators or nonsurgeons performing liposuction to be overly aggressive, trying to do too much with a single modality. Excessive liposuction is likely to cause contour deformities that can be difficult to treat.[42,54]

Complications

The 2 cases of deep venous thromboses in this series were both asymptomatic. The risk of pulmonary embolism from a distal thrombosis is low (2%).[57,58] However, propagation can lead to a dangerous proximal thrombosis. Early detection allows early treatment and confirmation of thrombus resolution by serial ultrasound scans.[10] The hematoma rate, 3.6%, counting patients treated with needle aspiration as well as surgical evacuation, is similar to other series (mean 3.8%).[6] The author does not use prophylactic anticoagulation, which is likely to increase the hematoma rate.[59]

A welcome benefit of eliminating the temporal incision is reducing the risk of skin necrosis of the cheek portion of the facelift flap. A uniplanar, sub-SMAS facelift does not impair skin perfusion.[6] No cases of lateral cheek skin loss were encountered in this series. This unusual complication can be distressing to patients because it is visible and requires time to heal, with increased facial scarring. Reducing the risk of this complication is another advantage of eliminating a temporal incision. Temporal hair loss is a non-issue.

Facial Neuropathies

Numerous publications report neuropathy rates <2%.[15] However, temporary muscle weakness after facelifts occurs more commonly according to plastic surgeons who perform balancing injections of neurotoxin in affected patients.[60] Its importance is underscored by the numerous published anatomic studies of the facial nerve branches, particularly the frontal branch,[61–66] and by the choice of many surgeons to adopt a superficial suture-plication technique.[2,15] Perhaps surprisingly, the risk of facial nerve injury in procedures that avoid a sub-SMAS dissection is not eliminated. Nerve ligature by sutures can cause neuropathies.[15,31] Jacono et al,[15] in their recent meta-analysis, report no difference in the rate of temporary facial nerve injury comparing the sub-SMAS technique with SMAS plication. Little[67] reported an 8% incidence of facial nerve branch injury with his imbrication technique, which takes place in a plane superficial to the SMAS. Ramirez[51] reported a similar rate of neuropraxia using a subperiosteal release and suture suspension technique.

Fortunately, frontal weakness is likely to recover because of the presence of 2–4 motor branches at the level of the zygomatic arch.[61] Despite this occasional complication, patient satisfaction remains high.[4] Temporary asymmetry may be made less conspicuous with an injection of botulinum toxin into the contralateral forehead.[31,40]

Limitations of this study include its retrospective design and lack of a comparison with a control group treated with orbicularis redraping and a traditional temporal incision. This study does not include a long-term evaluation of facial volume using quantitative measurements.

Fig. 9. This 60-year-old man underwent a facelift, submental lipectomy, upper and lower blepharoplasties, a chin implant, and fat injection. He is shown before (A) and 10 years after surgery (B). Photographs are matched for size and orientation.

CONCLUSIONS

A sub-SMAS dissection combined with fat injection safely combines the benefits of periorbital and neckline rejuvenation using a triple-vector platysmaplasty with restoration of lost facial volume. Excluding the temporal incision eliminates a portion of the traditional facelift scar that may be visible. Neuropathies still occur but are typically temporary. A secondary facelift may be indicated in some patients (7% in this series). Long-term studies that include evaluation of facial volume are recommended.

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