Safety and Adjuncts in Face Lifting

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PATIENT SAFETY

Learning Objectives: After studying this article, the participant should be able to: 1. Classify the commonly performed types of face-lift procedures based on the extent of skin incision and face and neck dissection, and superficial musculoaponeurotic system treatment and perform the appropriate amount of skin undermining in variations of superficial musculoaponeurotic system techniques. 2. Select the optimal placement of skin incisions and list the danger zones encountered in face-lift dissection and their relationship to the fat compartments and retaining ligaments. 3. Use fat grafting as an adjunctive procedure to face lift and apply safe skin resurfacing techniques at the time of rhytidectomy. 4. Institute a preprocedure and postprocedure skin care regimen and use an antihypertensive protocol for postoperative hematoma prevention. 5. List the commonly injured sensory and motor nerves in rhytidectomy, including prevention and treatment strategies.
Summary: Today's face lifts can be classified as "traditional," "short-scar," or "mini." Placement of skin incision, extent of dissection in the face and neck, and methods of superficial musculoaponeurotic system treatment are standard components of face-lift techniques. Proper knowledge of facial anatomy and danger zones is crucial for patient safety. Adjunctive fat grafting and skin resurfacing procedures can create superior results without adding to patient morbidity. Management options for more serious yet potentially preventable surgical complications are discussed, including hematoma and sensory and motor nerve injuries. (*Plast. Reconstr. Surg.* 144: 471e, 2019.)

Rhytidectomy remains a mainstay in facial rejuvenation today, with a 22 percent increase observed over the past 5 years and over 82,000 procedures performed in 2017 alone.[1] The rapid growth of noninvasive technologies has created a setting where many patients have undergone some form of less invasive facial procedure before pursuing rhytidectomy.[2] Despite this, rhytidectomy continues to provide greater and longer lasting results compared to its nonsurgical alternatives, with a well-performed face lift "lasting" up to 10 to 12 years before a secondary procedure is often indicated.[2–5]

SURGICAL TECHNIQUES

Face-Lift Classifications

Although the surgical principles of rhytidectomy have remained largely unchanged, the classification of face-lift techniques is increasingly complex in today's market. The plethora of highly variable techniques and marketing names introduced in the industry can obscure standard face-lift terminologies. Withstanding these limitations, the classification of face-lift techniques can be systematized based on three technical components: skin incision, face/neck dissection, and superficial musculoaponeurotic system (SMAS) treatment. As such, most face-lift procedures performed today can be classified as "traditional," "short-scar," or "mini" (Table 1 and Fig. 1).

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Table 1. Face-Lift Classification

Classification	Incision*	Dissection†	SMAS Treatment	Examples (First Author, Year)
Traditional				
Composite/deep-plane	Full	Full face and neck	SMAS elevated as composite flap with skin	Deep-plane lift (Skoog, 1974) Composite lift (Hamra, 1992) High SMAS‡ (Barton, 1992)
Lamellar SMAS flap	Full	Full face and neck	SMAS elevated as separate flap from skin	Trifurcated SMAS (Connell, 1995) High SMAS‡ (Marten, 2008) Extended SMAS§ (Stuzin, 1995)
SMAS plication	Full	Full face and neck	SMAS imbrication or excision/advancement	SMASectomy‖ (Baker, 1997) SMAS stacking¶ (Rohrich, 2009)
Short scar				
SMASectomy	Limited	Full face, limited neck	SMAS excision/advancement	Short-scar SMASectomy (Baker, 2001)
Suture suspension	Limited	Full face, limited neck	Purse-string suture suspension of SMAS	MACS lift (Tonnard, 2002) S-lift (Fulton, 2001)
Mini				
Highly variable	Limited	Limited face, no neck	Minimal to none	Quick lift, weekend lift, lifestyle lift

MACS, minimal access cranial suspension.
*Limited incision, preauricular only with or without short extension into temporal sideburn and/or retroauricular sulcus. Full incision, preauricular plus postauricular with extension into temporal and occipital scalp.
†Extent of dissection performed in the face/neck.
‡High SMAS refers to high suspension of SMAS flap over the zygomatic arch for greater malar elevation.
§Extended SMAS refers to extended medial cheek dissection over the zygomaticus major muscle.
‖In SMASectomy, a strip of SMAS is excised and the anterior mobile edge is fixed to the preparotid SMAS.
¶In SMAS stacking, the SMAS layer is incised and folded onto itself to increase fullness in the malar region.

Traditional Face Lifts

Traditional face lifts use full-length skin incisions for full access to the face and neck (Fig. 1). Most traditional face lifts performed today involve some form of SMAS treatment. Experience has shown that skin lift alone is unsustainable with elastic stretch over time, and deep tissue support is necessary for durable results.[6,7] A recent survey showed that SMAS plication (37 percent) was the most preferred face-lift technique, followed by SMASectomy (17 percent) and sub-SMAS dissection (10 percent).[8] To date, there is no conclusive evidence supporting the superiority of one SMAS technique over another.[9]

The extent of skin flap dissection performed in traditional face lifts varies depending on the SMAS technique (Table 2 and Fig. 2). The distance of skin undermining dictates the degree of separation between the skin and SMAS layers. In composite deep-plane lifts, minimal skin undermining preserves all retaining ligaments between the cheek skin and SMAS.[10–13] This allows the skin and SMAS layers to be suspended together as a composite flap. In lamellar SMAS flap techniques, limited skin undermining is performed up to the anterior border of the masseter to preserve skin and SMAS connections in the midcheek. This allows the inferior cheek skin to be vertically elevated with SMAS flap rotation.[14–16] In SMAS plication techniques, extended skin flap elevation is typically performed well into the midcheek to allow for untethered access to the medial SMAS.[16,17]

Short-Scar and Mini Face Lifts

Short-scar and mini lifts use limited skin incisions in the preauricular area (Fig. 1). Dog-ears can be excised with short extensions into the temporal sideburn and/or the retroauricular sulcus.[18–21] Short-scar lifts typically use some form of SMAS treatment in the cheek (Table 1).[19,22,23] Mini lifts generally involve much less dissection, minimal to no SMAS work, and often do not address the neck. It is important to note, however, that many arbitrary variations exist for short-scar and mini face lifts. These limited-incision techniques are especially subject to marketing inconsistencies, and actual procedures performed may range anywhere from a skin-only lift to SMAS plication.

Although limited-incision techniques avoid postauricular scars and are "ponytail friendly," they provide limited access to the neck[21,24] (Table 3). The ideal candidate for limited-incision techniques is young (late 30s to 40s), has primarily facial aging with early jowling, and has minimal cervical skin laxity.[19,20,23] Patients with severe cervical skin laxity are typically not candidates and require full-length incisions extending into the occipital area to adequately address the neck.[18,21,24–27] In patients with medial platysmal banding or submental lipodystrophy, one should not hesitate to address the anterior neck separately with liposuction or open midline platysma plication.[18,20,23,28,29]

Fig. 1. Face-lift classifications. Short-scar and mini lifts use limited skin incisions in the preauricular area (*black solid line*). Traditional face lifts use full-length skin incisions that extend into the temporal and occipital scalp (*black dotted line*). The extent of dissection performed in the mini lift is minimal in the face and typically does not involve the neck (*green striped area*). The extent of dissection in the short-scar lift is somewhat greater in the cheek and may extend partially into the neck (*red line*). The extent of dissection in the traditional face lift typically involves the full face and neck (*purple line*).

Skin Incisions

Optimal placement of face-lift incisions is subject to nuances and varies by patient (Table 4). Preauricular incisions can be placed in the posterior margin of the tragus (intratragal/posttragal) or preauricular skin crease (pretragal) (Fig. 3). Intratragal or posttragal incisions offer superior scar concealment and are most commonly used. In men with heavy beards, hair follicles can be resected or cauterized with low energy from the undersurface of the tragus flap to avoid bringing hair-bearing skin onto the ear.[14,29] Tragus inset must preserve sharp, distinct transitions, especially at the incisura, to avoid blunting the inferior tragal border.[14,15] [**See Video 1 (online)**, which displays face-lift incision planning.] Retroauricular incisions are placed directly within the auriculomastoid groove in men or slightly (2 mm) onto the posterior conchal skin in women (Fig. 4).[14,29]

Temporal and occipital incisions can be placed within the hair-bearing scalp or along the hairline, or a combination of both (Fig. 5). The inverted-L incision placed in the temporal sideburn avoids objectionable sideburn elevation, especially in patients who require significant vertical cheek skin redraping.[14,20] Occipital incisions placed along the posterior hairline are potentially more visible, but may be necessary to avoid objectionable posterior hairline displacement in massive-weight-loss patients or patients with significant neck skin excess.

FACIAL ANATOMY AND DANGER ZONES

The fat compartments and retaining ligaments of the face are intimately related. The superficial fat compartments of the cheek are separated by septal barriers arising from the SMAS (Fig. 6). These junctions also represent areas of fascial coalescence where retaining ligaments often arise.[30–32]

Retaining Ligaments

Retaining ligaments are soft-tissue support structures of the face arising from the underlying facial skeleton or deep fascia.[32] The three major retaining ligaments of the face are the zygomatic ligament, the mandibular ligament, and the masseteric cutaneous ligaments (Fig. 7). The zygomatic ligament arises from the zygomatic eminence at the superior junction of the middle cheek and

Table 2. Skin Flap Undermining in Traditional Face Lifts

SMAS Technique	Skin/SMAS Separation	Skin Flap Undermining	Divided Connections between Skin/SMAS	Rationale
Composite/deep-plane	Minimal	Preauricular/preparotid only	None	SMAS and cheek skin remain connected as a composite flap
Lamellar SMAS flap	Limited	Extends over zygomatic eminence, but limited in anterior midcheek	Zygomatic ligaments	Inferior cheek skin remains attached to SMAS flap for greater vertical mobility
SMAS plication	Extended	Past zygomaticus origin, into the midcheek	Zygomatic ligaments, masseteric ligaments	Allows untethered access to medial SMAS for plication

Fig. 2. Skin flap undermining in traditional face lifts. The extent of skin flap dissection in traditional face lifts varies depending on the SMAS technique and dictates the degree of skin-SMAS separation. Minimal skin undermining (to *green line*) is performed in deep-plane composite face lifts to preserve all retaining ligaments between the cheek skin and SMAS. This allows the skin and SMAS layers to be suspended as a composite flap. Limited skin undermining (to *red dotted line*) is performed in lamellar SMAS flap techniques. The zygomatic ligaments are divided but the masseteric ligaments are preserved to maintain connections between the anterior cheek skin and SMAS. This allows for the inferior cheek skin to be vertically suspended along with SMAS flap rotation. Extended skin flap dissection (to *purple line*) is performed in SMAS plication techniques. All skin-SMAS connections are released into the midcheek to allow for untethered access to the medial SMAS.

infraorbital fat. The mandibular ligament arises from the tubercle of the mandible at the cheek-chin junction and delineates the anterior border of the jowl.[33,34] The masseteric cutaneous ligaments arise from the masseteric fascia to form fibrous connections to the skin along the anterior border of the masseter.[32,35,36] Retaining ligaments are important landmarks in identifying the danger zones of face-lift dissection, which are discussed below.

Danger Zones

The danger zones of the face occur in transition points between fat compartments or areas of dense retaining ligaments, where tissue layers converge and inadvertent transitions between tissue planes may occur.[30,34,37,38] Four danger zones are encountered in face-lift dissection where facial nerve branches are especially vulnerable to injury (Fig. 7), as follows:

1. The first danger zone is just inferior and lateral to the zygomatic eminence, where the zygomatic and upper masseteric ligaments convene.[10,11,14,39,40] Here, the zygomatic branches of the facial nerve become relatively superficial and may even occasionally course over the zygomaticus major muscle origin to innervate the orbicularis oculi.[14,40,41]
2. The second danger zone occurs in the transition from the lateral to middle cheek fat. Once anterior to the parotid, dissection transitions to a loose areolar plane that can easily lead into the deep buccal fat pad, where the buccal branch is vulnerable to injury.[30,34,42]
3. The third danger zone is located at the inferior masseteric border, where the lower masseteric ligaments arise. The marginal mandibular branch is vulnerable to injury here as it exits the parotid tail encased in the thin sub-SMAS fat. Inadvertent deflection into the subplatysmal plane may also occur here, especially in thin patients with an atrophic platysmal layer that is easily tented up during retraction.[37]
4. The fourth danger zone is in the region of the mandibular ligament or cheek-chin

Table 3. Limited versus Full-Incision Face Lifts

Limited incision (short-scar, mini lift)
Pros
No postauricular scar
"Ponytail friendly"
No postauricular dissection
Easier hematoma evacuation
Cons
Limited access to neck and submental region
Perhaps less longevity in cervical contour
Occasional skin folds at base of earlobe require time to smooth
Mandates vertical cheek skin redraping
Full incision (traditional face lift)
Pros
Greater versatility in skin flap redraping
Redistributes excess infralobular skin folds
Minimize temporal hairline scar/distortion
Perhaps greater longevity in cervical contour
Greater versatility in older patients with severe cervical laxity or sun-damaged skin
Cons
Postauricular scar
Posterior hairline distortion
Requires postauricular dissection

Table 4. Skin Incisions

Variations	Description	Pros	Tips
Temporal			
Scalp	Vertical incision well within temporal hair	Hidden scar	OK in young patient with low/full sideburn; use more oblique vector for cheek skin redraping
Hairline	Inverted-L incision in sideburn with or without extension along anterior temporal hairline	Less posterior hairline displacement and sideburn elevation	Useful in older patients, secondary or tertiary procedures, or short-scar lifts with vertical skin redraping
Occipital			
Scalp	Transverse incision well into occipital hair	Hidden scar	Avoid in severe neck redundancy; realign hairline to avoid stepoff
Hairline	Incision along occipital hairline	Allows greater excision of excess neck skin without displacing hairline; avoids notching	Hide incision in junction of thick and thin hair on nape of neck; bevel incision
Preauricular			
Intratragal and/or posttragal	Within or along posterior margin of tragus	Scar hidden in natural anatomic interfaces	Maintain sharp borders during tragal inset; destroy hair follicles in tragal flap in men
Pretragal	Anterior to helix in pretragal sulcus	Avoids transferring hair-bearing skin onto tragus in men; simpler inset	Consider if obvious cheek/tragal skin color mismatch, or prominent tragal cartilage
Retroauricular			
Posterior concha	Incision slightly onto posterior conchal skin	Better hidden; prevents inferior scar migration	Bring incision 2 mm onto back of ear, preferred in women
Auriculomastoid groove	Incision placed precisely in groove	Avoids pulling hair onto back of ear	Preferred in men to keep incision off back of ear

junction, where tissue layers become relatively compressed. The marginal mandibular branch is also vulnerable to injury here. In patients with severe jowling who may require formal release of the mandibular ligament, dissection past this highly vascular zone should proceed with caution.[30,33] Bleeding often results and cautery should be used judiciously to avoid dermal injury.[37]

Superficial versus Deep-Plane Dissection

Contrary to the assumption that deep-plane dissection puts facial nerve branches at greater risk, the incidence of facial nerve injuries in sub-SMAS techniques has *not* been reported to be higher.[10,12,37,43–45] Subcutaneous skin flap dissection can easily deflect into deeper planes, especially if consistent skin flap thickness is not ensured. Transillumination with the contralateral operating room light provides a useful visual cue of precise skin flap thickness during subcutaneous flap elevation.[37] The false security of blind dissection in what is thought to be a superficial plane is more detrimental than careful dissection under direct vision in a known sub-SMAS plane.

FAT GRAFTING

Adjunctive fat grafting at the time of rhytidectomy is critical to achieving comprehensive facial rejuvenation. According to a 2015 American Society of Plastic Surgeons survey, over 85 percent of surgeons use fat grafting at the time of face lift.[46] Patients undergoing lipofilling with face lift report significantly higher satisfaction than patients undergoing face lift alone.[47]

The Midface

Fat grafting is a highly effective method to improve the midface without increasing surgical morbidity. The midface, including the malar mound and nasolabial folds, has classically been a difficult region to treat with the classic rhytidectomy.[4,14,48] Effective elevation of the malar mound requires "high" SMAS suspension above the level of the zygomatic arch to achieve noticeable results, which unfortunately carries the risk of frontal branch injury.[10,14,39,49] Furthermore, earlier attempts to improve the nasolabial fold involved extensive cheek dissection past the nasolabial groove, which increased perioral distortion and swelling without providing significant aesthetic improvement.[4,10,11,14,15,17,49]

Fat Compartments

The superficial fat compartments of the cheek include the superficial lateral and middle malar fat pads. The deep midfacial fat compartments include the deep malar fat and nasolabial fat[33,50] (Fig. 8). Although the superficial cheek fat is also amenable to surgical manipulation by means of

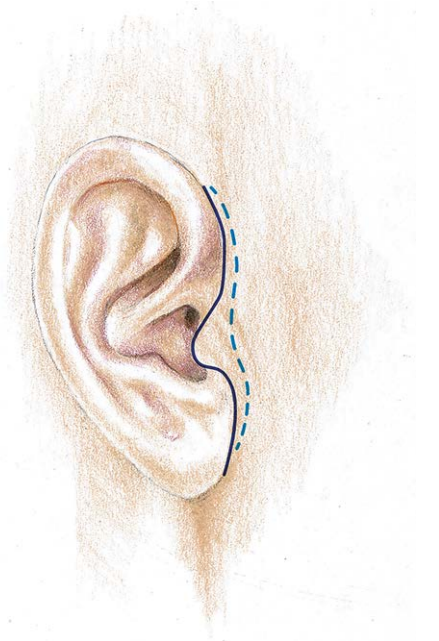

Fig. 3. Preauricular incision. Intratragal/posttragal incisions (*solid line*) are most commonly used and are hidden in the posterior margin of the tragus. Pretragal incisions placed in the preauricular skin crease (*dashed line*) are more visible but may be useful in patients with obvious cheek-tragal skin color mismatch or a prominent tragal cartilage.

Fig. 4. Postauricular incision. Retroauricular incisions can be placed slightly (2 mm) onto the posterior conchal skin in women for better scar concealment and to prevent inferior scar migration.

SMAS suspension, the deep malar fat lies deep to and separate from the SMAS (Fig. 6) and is primarily altered with lipofilling.[14,46]

Fat Grafting Sequence

Concomitant fat grafting with rhytidectomy is usually completed in the beginning of the procedure, before any skin incision. [**See Video 2 (online)**, which shows adjunctive fat grafting during face lift.] The deep compartments are generally filled first to create the foundation for lipofilling of more superficial compartments. The deep medial cheek compartment is the first and most critical compartment to be filled.[48,51] Deflation of the deep medial cheek fat is particularly influential in the aging process. Selective augmentation of this compartment alone has been shown to improve anterior cheek projection, diminish nasolabial fold prominence, and improve tear trough appearance.[50,52,53] The nasolabial fat is filled next from a proximal access point, with additional fat placed deep on the pyriform in patients with especially thick proximal nasolabial folds. Next, the superficial high lateral cheek is volumized to accentuate malar highlights in women. This should be avoided in men because of potential feminizing effects.[29,48] The superficial middle and lateral malar compartments are then filled to blend the lower cheek junction and nasojugal crease.[46,51,54] Fat grafting of the superficial perioral compartments can also be performed to help reinflate the nasolabial region and diminish the appearance of perioral rhytides.[46,55]

SKIN RESURFACING

Skin resurfacing procedures help improve overall skin quality and dermal rhytides in areas not typically reached with face-lift dissection, including the perioral and glabellar regions. Performed judiciously, simultaneous skin resurfacing with face lift is safe and allows for greater patient comfort with a single anesthetic event and recovery.

Indications

Simultaneous skin resurfacing with rhytidectomy should only be performed on thick, vascularized skin flaps and nonsmokers.[56] Skin resurfacing procedures are typically performed at the conclusion of the rhytidectomy, after all skin incisions are closed. This allows visual confirmation of skin flap thickness at the time of face-lift dissection. Relatively aggressive skin resurfacing media such as phenol peels and nonfractionated carbon dioxide lasers should be avoided with rhytidectomy.

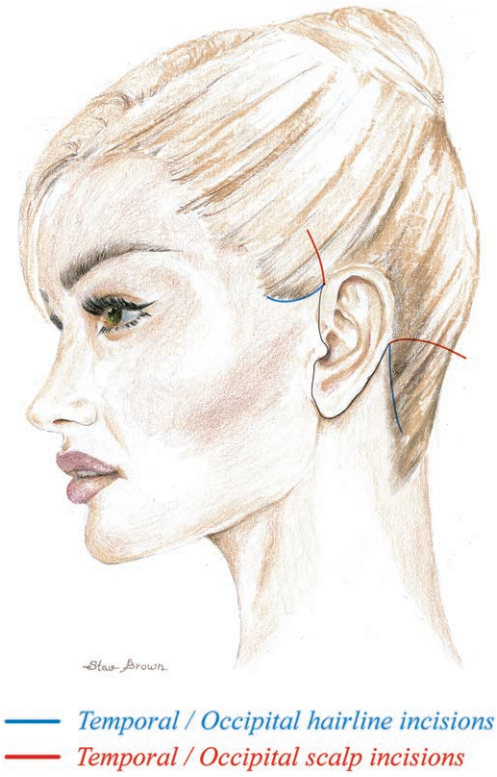

Fig. 5. Temporal and occipital incisions. Incisions in the temporal and occipital regions can be placed within the scalp or along the hairline. Scalp incisions (*red lines*) are placed well within the hair-bearing scalp for better scar concealment. Hairline incisions (*blue lines*) are potentially more visible but avoid objectionable hairline displacement. The temporal hairline incision is made as an inverted-L in the temporal sideburn to avoid sideburn elevation. The occipital hairline incision can be made in the junction of the thick and thin nape hair in the neck for better concealment.

Without proper expertise, these techniques tend to create "all-or-none" effects that can lead to irreversible scarring, severe dyschromias, and even skin loss over undermined flaps.[57–59] For adjunctive use at the time of rhytidectomy, more reproducible resurfacing techniques are preferred, including the erbium laser and trichloroacetic acid peel. Microneedling has also recently emerged as a versatile option.

Erbium Laser

Ablative laser resurfacing can be safely performed at the time of rhytidectomy in fair-skinned patients (Fitzpatrick types I and II).[56] Darker skinned patients are at increased risk for dyspigmentation, and alternative modalities should be considered. Erbium laser is preferred for full-face resurfacing during rhytidectomy, as it can be used in pure ablative mode without coagulative effects.[56] The carbon dioxide laser, in contrast, has a coagulative component that may induce thermal damage of dermal vasculature and is associated with prolonged erythema and recovery.[59–61] When using the nonfractionated erbium laser, ablation depth should be kept below 100 μm. Energy can be further diffused over undermined areas by aiming the laser beam at an oblique angle.[56] Only one pass should be performed over undermined areas, whereas two passes can be performed over nonundermined, thicker skin (i.e., perioral, glabellar regions).

Trichloroacetic Acid Peel

Simultaneous skin resurfacing with 35% trichloroacetic acid peel at the time of rhytidectomy is shown to be a safe and effective treatment for superficial to moderate rhytides.[62] It is an accessible and affordable alternative to laser resurfacing. Use of trichloroacetic acid peels should be limited to lighter skinned patients (Fitzpatrick type I to III).[58,62–68] The peel is applied with a 2 × 2-inch sponge gauze. The number of passes (typically, two to four) is customized for depth of penetration.[62] Fewer passes should be performed over thin periorbital or undermined cheek skin, with the endpoint of a light frost with pink hue. A deeper peel can be performed over deep perioral or glabellar rhytides, with the endpoint of a more opaque white frost. This signals that the papillary dermis has coagulated and the upper reticular dermis is reached.[58,62] A gray hue indicates deeper penetration and should never be seen.

Skin Care Regimen

All face-lift patients undergoing ablative skin resurfacing should be optimized with a perioperative skin care regimen. Pretreatment with topical tretinoin (0.025% to 0.1%) accelerates reepithelialization and should be instituted at least 1 month before the procedure.[60,69–71] In patients with Fitzpatrick type III or higher skin type, pretreatment with 4 weeks of hydroquinone (2% to 4%) may help reduce the risk of hyperpigmentation.[56,72] After laser resurfacing, use of semiocclusive dressing for the initial 24 hours to 4 days can reduce pain, pruritus, and crust formation.[56,73] Postprocedural care involves daily use of light moisturizer and cleanser such as EltaMD (Colgate-Palmolive Co., New York, N.Y.) or Cetaphil (Galderma Laboratories, Fort Worth, Texas). Hydroquinone should be started at the first sign of any postinflammatory hyperpigmentation.[56,72,74] Tretinoin can resume after all skin irritation and peeling have subsided, typically in 3 to 4 weeks.[56,62,69] Oral

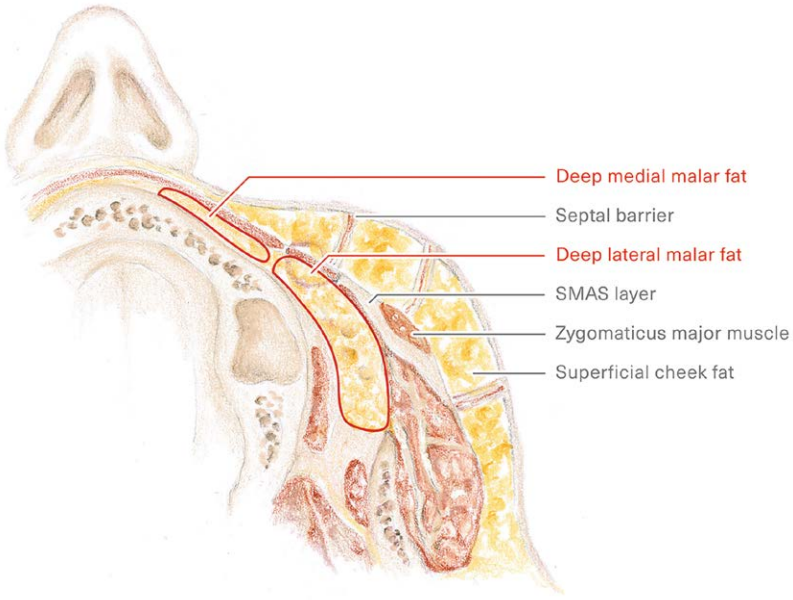

Fig. 6. Cross-section illustrating the superficial and deep malar fat compartments relative to the SMAS layer. The superficial cheek fat pads are separated by septal barriers arising from the SMAS, whereas the deep malar fat pads lie deep to and separate from the SMAS.

valacyclovir (500 mg twice daily) should be started 2 days before and continued for 7 days after resurfacing.[56,62]

Microneedling

Although ablative modalities of skin resurfacing (i.e., lasers, peels) can provide excellent results, experience has shown that injuring deeper layers of skin risks prolonged healing times, pigment changes, and scarring.[75–77] This is particularly the case for patients with higher Fitzpatrick skin types (i.e., IV through VI). Microneedling has emerged as a popular and effective nonablative skin rejuvenation therapy that is safe in all skin types, including darker skinned patients who may not be candidates for laser resurfacing or chemical peels. Microneedling works by introducing microlesions in the papillary and reticular dermis in a purely mechanical way.[78] This injury induces dermal neocollagenesis and elastogenesis within 4 to 6 weeks of treatment.[75,78–80] Treatment endpoints are light erythema for full-face resurfacing and fine pinpoint bleeding in select areas of deeper rhytides (perioral, glabellar). Microneedling can be safely performed at the time of face lift, as it preserves skin vascularity and the stratum corneum and epidermal barrier function. Minimal disruption of the epidermis leads to an appearance of "scarless" wound healing. Similar to laser and chemical resurfacing, microneedling is typically performed at the conclusion of the face lift, after all skin incisions are closed.

Platelet-Rich Plasma

Platelet-rich plasma is composed of a concentrated mixture of platelets and growth factors, including vascular endothelial growth factor, platelet-derived growth factor, and transforming growth factor-beta. Platelet-rich plasma is believed to deliver a supraphysiologic concentration of these biologically active substances, which in turn modulate desirable pathways of antiinflammation and tissue repair.[81,82] It is prepared from the patient's venous blood by means of a centrifugation process simplified with commercially available kits. Platelet-rich plasma can be applied percutaneously over resurfaced skin after skin resurfacing procedures to assist in the healing process.[81,83–85] Popularly used in conjunction with microneedling, it is often marketed together as the "vampire facial."

ADVERSE EVENTS

This section discusses some of the more devastating yet potentially preventable surgical complications following rhytidectomy,

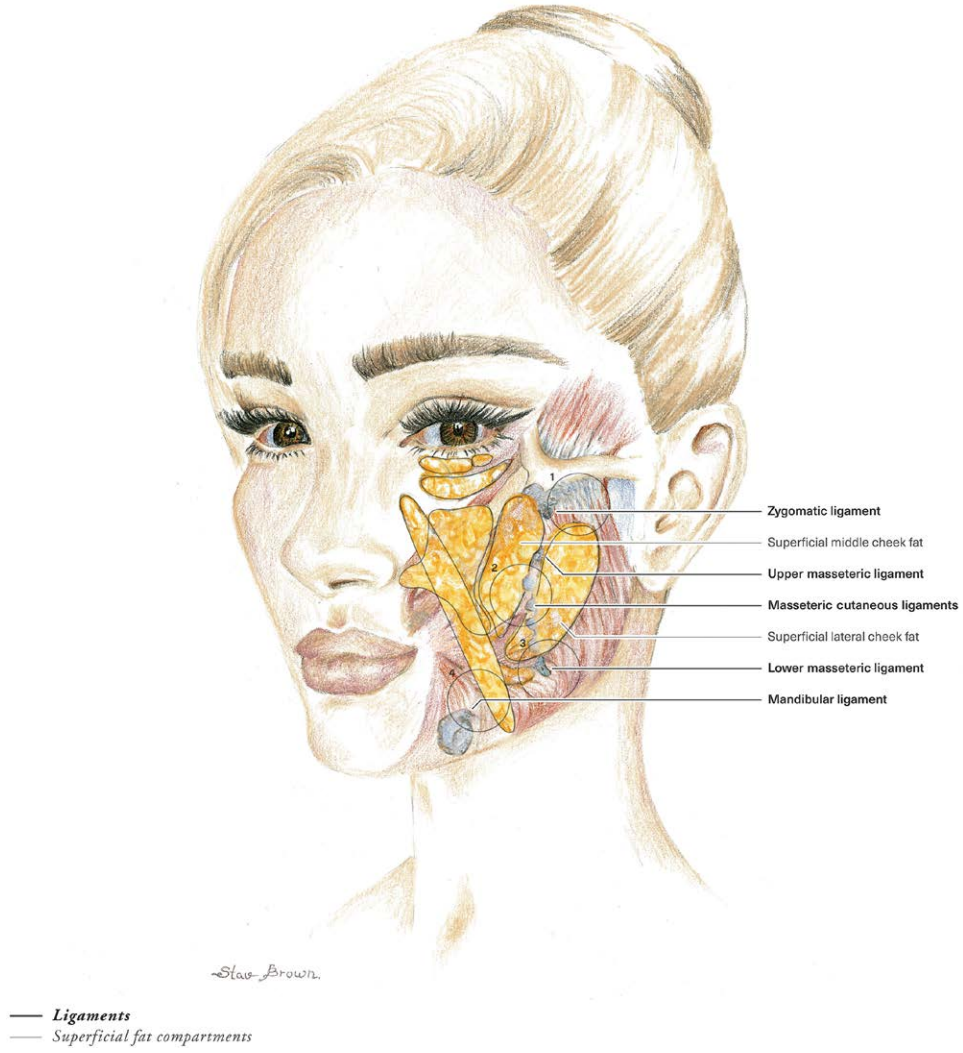

Fig. 7. Retaining ligaments and danger zones. The three major retaining ligaments of the face are the zygomatic ligament, the mandibular ligament, and the masseteric cutaneous ligaments. Four danger zones are encountered in face-lift dissection where facial nerve branches are especially vulnerable to injury. These danger zones occur in transition points between superficial fat compartments or in areas of dense retaining ligaments. *1*, The first danger zone lies between the region of the zygomatic and the upper masseteric ligaments. The zygomatic branch of the facial nerve becomes relatively superficial here and is vulnerable to injury. *2*, The second danger zone lies anterior to the parotid, in the transition from the superficial lateral to middle cheek fat compartment. The buccal branch of the facial nerve is vulnerable to injury in this loose areolar plane. *3*, The third danger zone lies in the region of the lower masseteric ligaments. The marginal mandibular branch of the facial nerve is vulnerable to injury here as it exits the tail of the parotid. *4*, The fourth danger zone is in the region of the mandibular ligament. Dissection past the cheek-chin junction should proceed with caution in this highly vascular zone.

including hematoma and sensory and motor nerve injuries.

Hematoma

The incidence of hematoma ranges from 0.9 to 4 percent following rhytidectomy.[8,86–91] Men are at increased risk given their thicker and more vascular skin.[29,87] Hematomas must be attended to promptly. Unaddressed hematomas can lead to skin slough, fibrosis, or infection. Early acute hematomas caused by generalized oozing rather than a specific "bleeder" may be addressed at

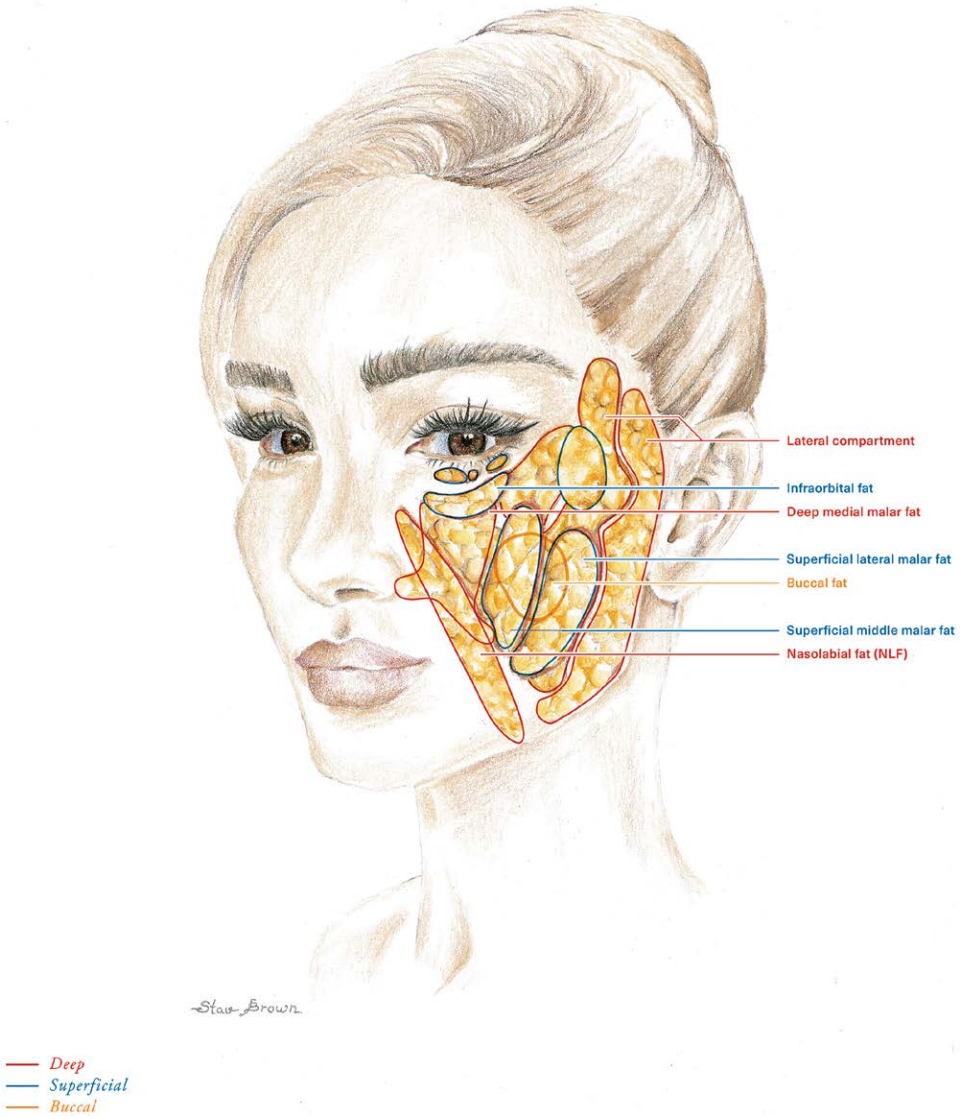

Fig. 8. Fat compartments. The superficial fat compartments of the cheek include the superficial middle and lateral malar fat. The deep midfacial fat compartments include the deep medial malar fat and the nasolabial fat.

the bedside by opening the postauricular incision under local anesthesia and inserting a small suction catheter for drainage and irrigation.[92] If the hematoma reaccumulates or is large, formal surgical exploration should be performed. Intraoperative hemostasis should be obtained under normotension, as hypotensive anesthesia may mask potential bleeding sites.[8,91,93]

Blood Pressure Management

Perioperative hypertension is the single most important modifiable risk factor in hematoma prevention.[87,94] All patients regardless of medical history should be managed with a strict antihypertensive protocol. Patients with preexisting hypertension should continue routine medications perioperatively, with the exception of diuretics, which are held for 1 to 2 days after surgery.[87,91] All aspirin and nonsteroidal antiinflammatory agents should be stopped at least 2 weeks before surgery.[86,87,91,95] Early postoperative hypertension (systolic blood pressure >140 mm Hg) is most strongly correlated with hematoma, over preoperative or preexisting hypertension.[8,91,96] Prevention of postoperative hypertension should first target potential contributory causes. This includes early and aggressive treatment of any postoperative pain, anxiety, and nausea/vomiting with oral or intravenous medications.[8,87,91,96–98] Oral antihypertensive agents such as labetalol or nicardipine may then be used as needed for breakthrough hypertension.[8,91]

Clonidine is a long acting alpha-2 agonist which, when administered early, has been shown to decrease postoperative hypertension and hematoma rates.[29,87,91,93,96,99] Preoperative administration of oral or transdermal clonidine on the morning of surgery has been used safely in rhytidectomy patients with and without preexisting hypertension. It can be considered as a prophylactic antihypertensive measure in routine rhytidectomy patients or higher risk individuals (i.e., men or those with preexisting hypertension).[29,87,91,96,99]

Sensory Nerve Injury

Some of the most common "adverse events" reported by face-lift patients at 6 months are facial numbness, tingling, or sensitivity.[100,101] Although distressing to the patient, most sensory changes are transient and self-resolve within 6 to 12 months. However, injury to the great auricular nerve can be much more devastating. Painful neuroma may result from suture plication or partial severance of the great auricular nerve, and severe cases of unabated pain may require early surgical exploration. The great auricular nerve provides sensory innervation to the posterior auricle and ear lobule. It is the most commonly injured nerve in rhytidectomy, with an estimated incidence of 6 percent.[38,102] The great auricular nerve is most vulnerable to injury 6.5 cm inferior to the external auditory canal (McKinney point) where it crosses the midbelly of the sternocleidomastoid muscle.[103] Postauricular skin flap dissection should be performed under direct vision over the sternocleidomastoid muscle, and the fascia should be kept down over the muscle to avoid great auricular nerve injury. Skin flap dissection should remain relatively thin directly under the ear lobule. Platysmal suspension sutures, if placed, should span the location of the great auricular nerve.[104]

Motor Nerve Injury

The most commonly injured facial nerve branch is thought to be the buccal branch. Buccal branch weakness, often noticed as diminished or asymmetric upper lip elevation while smiling, typically recovers relatively quickly because of significant arborization between the buccal and zygomatic branches.[38] The mandibular and temporal branches are much less forgiving because of their paucity of interconnections.[37,38,88] Marginal mandibular branch palsy causes the lower lip to remain up and flat on the affected side during smiling because of weakness of the lower lip depressors.[38] Temporal branch injury weakens eyebrow elevation and diminishes transverse forehead rhytides on the affected side. The incidence of permanent facial nerve injury after rhytidectomy is extremely low (<1 percent).[37,38,88] Early recovery of some degree of motion, even if slight, usually indicates incomplete injury, and gradual resolution can often be expected within 6 months. Chemoparalysis with neurotoxin on the contralateral side may be considered to improve symmetry while waiting for complete recovery.

CONCLUSIONS

Rhytidectomy remains the most effective method of achieving long-lasting facial rejuvenation. In-depth understanding of facial anatomy and recognition of danger zones help maintain safety during face-lift dissection. Surgical adjuncts including fat grafting and safe skin resurfacing are critical components needed to achieve comprehensive results.

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