Skin Resurfacing in Combination with Facelift Surgery

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Facial Plast Surg 2017;33:299–310.

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Abstract

Facial aging is a combination of descent of facial tissues, atrophy of fat compartments, bony remodeling, and chronological and photoaging changes of the skin. A rhytidectomy will address the aging changes due to gravity on facial tissues but will do little to improve skin texture, thickness, and pigmentation. To address collagen loss, rhytids, and dyspigmentation, surgeons are incorporating resurfacing techniques including carbon dioxide/erbium ablative and fractionated lasers, 35% trichloroacetic acid chemical peel pretreated with Jessner's solution, phenol 88% chemical peel, Baker's solution chemical peel, and dermabrasion. More recently, surgeons are approaching facial aging with a more comprehensive approach to address both gravity and collagen changes by a combination of rhytidectomy with resurfacing. Technique and modality selection are keys to maximum single treatment results and therefore the greatest patient satisfaction.

Keywords
- rhytidectomy
- resurfacing
- fractionated laser
- chemical peel

Rhytidectomy is a surgery of balance and judgment. The goal is to create a refreshed and natural look by lifting the midcheek and jowl tissues and by smoothing the neck bands and excess skin. Facial aging, however, is only partially explained by gravity and descent of facial and neck tissues. Fat compartments in the face atrophy, bone remodels, and the skin undergoes chronological and photoaging changes. Cutaneous photoaging is related to sun ultraviolet (UV)-exposure. On a microscopic level, chronological aging includes disorganized collagen, thin epidermis, flat dermal–epidermal junction, decreased fibroblasts, and collagen.[1] Photoaging includes increased or decreased thickness of the epidermis, accumulation of elastin fibrils below the dermal–epidermal junction (solar elastosis), increased vascularity, and hypercellular dermis.[1] Patients will notice rhytids of the cheek, perioral region, and crow's feet area with actinic changes and solar lentigines across the face.

The rhytidectomy will address the aging changes due to gravity on facial tissues but will do little to improve skin texture, thickness, and pigmentation. In fact, the term rhytidectomy is a misnomer in that a facelift does not excise wrinkles. It only lifts and tightens sagging tissues. To address collagen loss, rhytids, and dyspigmentation, surgeons are incorporating resurfacing techniques including carbon dioxide (CO_2)/erbium ablative and fractional lasers, 35% trichloroacetic acid (TCA) chemical peel pretreated with Jessner's solution, phenol 88% chemical peel, Baker's solution chemical peel, and dermabrasion. Using multiple modalities for skin resurfacing for an individual patient to treat each area of the face and neck, separately yet blended, depending on the need for a certain depth of treatment is the key to the overall best result in most cases. Technique and modality selection are keys to maximum single treatment results and therefore the greatest patient satisfaction. The mechanism of resurfacing techniques is to create dermal collagen reorganization and new collagen deposition.[2] This will be seen as brightening, smoothing, tightening, and plumping of the skin. The degree of tightening, however, will not replace the surgical tightening and lifting from a rhytidectomy. More recently, surgeons are approaching facial aging with a more comprehensive approach to addressing both gravity and collagen changes by a combination of rhytidectomy with resurfacing. Our preferred technique is the combination of rhytidectomy and CO_2 fractionated laser resurfacing. Several considerations must be made to ensure that the laser treatments are performed safely and do not compromise the rhytidectomy flaps.

Issue Theme Beyond the Facelift: Procedures to Enhance Rhytidectomy; Guest Editor, Devinder S. Mangat, MD

DOI https://doi.org/10.1055/s-0037-1602742.
ISSN 0736-6825.

Patient Selection/Consultation

Developing rapport with the patient is the most important initial step in any consultation. To build the physician–patient relationship, the patient needs to feel confident in the physician's abilities and judgment. This allows the patient to trust that the surgeon will not only do the very best operation possible but also compassionately manage any problems or complications postoperatively. In the majority of patients, this can be accomplished by thoroughly discussing the patient's concerns and ideas.

During the consultation, the surgeon should explore the patient's motivations and expectations. It is important to establish realistic expectations and an understanding of potential complications associated with combined modality treatment. The surgeon may need to defer treatment and schedule a second consultation to explore the patient's motives and expectations further. Unrealistic expectation is a contraindication to surgery.

It is important to highlight the elective nature of the cosmetic surgery and the goal of safety and preventing complications. Any medical condition that may prolong or compromise the postoperative healing phase in patients should be discussed with the patient. These conditions include diabetes, peripheral vascular disease, collagen and vascular diseases, a history of keloids and hypertrophic scars, perpetual UV light exposure, extensive fibrosis from prior cosmetic treatments, prior radiation, and some autoimmune disorders. Combined rhytidectomy and resurfacing may be performed on some of these patients, but additional preoperative counseling is required regarding the risks of increased flap necrosis and sloughing. Many of these patients will not be candidates for rhytidectomy alone nor rhytidectomy combined with resurfacing. Loss of adnexal structures will compromise patients who have a history of head and neck radiation, and they are not considered candidates for rhytidectomy or combined rhytidectomy and facial resurfacing.

Patients who are active smokers are at a much higher risk of compromising vascularity of the skin flap and partial flap necrosis. Therefore, the authors deem active tobacco use as a contraindication to simultaneous rhytidectomy with laser resurfacing. Patients are also not allowed to use nicotine patches in substitution for smoking. Patients may be referred to their primary physician to assist in the management of smoking cessation.

A history of cold sores or herpes simplex virus outbreaks is not a contraindication to the combined rhytidectomy and resurfacing technique. However, this history must be carefully reviewed in the consultation. Resurfacing techniques may trigger an outbreak of herpes simplex virus, even if patients have not had an outbreak before. Approximately 7% of patients without a history of fever blisters had an outbreak following CO_2 laser resurfacing when untreated.[3] Therefore, all patients should be pretreated with antiviral medications to prevent a viral outbreak across the treatment area. Active bacterial or viral (herpes simplex virus) infection is an absolute contraindication to combined rhytidectomy and resurfacing technique.

Important medications to review include the previous or current use of powerful retinoids such as isotretinoin (Accutane, Roche Pharmaceutical). Isotretinoin can increase scarring from facial resurfacing and can blunt regrowth of epithelial appendages—which are required for reepithelialization.[4,5] The authors recommend waiting 6 to 12 months after use of isotretinoin before undergoing any ablative resurfacing procedure.

The senior author (S.W.P.) routinely performs combined rhytidectomy and facial resurfacing under general anesthesia. High-risk conditions for elective surgery include unstable cardiovascular disease, poor pulmonary reserve, acute/chronic hepatitis or renal failure, immunosuppressed patients, or patients with chronic illnesses that might prevent adequate postoperative healing. However, patients with pacemakers are usually able to undergo this procedure as well as patients who have had a previous myocardial infarction, placement of coronary artery stents, or coronary artery bypass surgery. These patients must be doing well, stable, and cleared for anesthesia by their cardiologist. Patients who are unable to tolerate general anesthesia or who are medically not cleared for surgery are not candidates for this procedure. A low threshold is recommended for obtaining medical clearance and open communication with the anesthesiologist.

Physical Examination/Classification

The ideal patient for combined rhytidectomy and resurfacing has a fair complexion with lesions amenable to resurfacing treatment. There are two main classification systems for facial skin. The Fitzpatrick classification uses the skin's response to sun exposure and the patient's baseline skin color to categorize patients I to VI (►**Table 1**).[6] The ideal candidate for deep resurfacing would be a person with Fitzpatrick skin type I or II as they have less risk for pigmentation changes.[7] The Glogau classification I to IV includes photoaging, age, and makeup (►**Table 2**).[8] Most patients who need a combined rhytidectomy and resurfacing technique are a Glogau III to IV. Patients who have solar damage, with particular reference to solar lentigines, freckles, and other pigmentation that extends all the way to the preauricular region and ear, as well as extending down onto the neck, are not candidates for combined resurfacing at

Table 1 Fitzpatrick classification

Skin type	Skin color	Tanning response
I	White	Always burns, never tans
II	White	Usually burns, tans with difficulty
III	White	Sometimes mild burn, average tan
IV	Brown	Rarely burns, tans with ease
V	Dark brown	Very rarely burns, tans very easily
VI	Black	No burn, tans very easily

Table 2 Glogau classification

Type	Photoaging	Age	Makeup
I	Mild pigmentary changes No keratosis Minimal wrinkles	20s–30s	Minimal or no makeup
II	Early senile lentigines visible Keratosis palpable but not visible Parallel smiles lines beginning to appear	Late 30s–40s	Usually, wears some foundation
III	Obvious dyschromia Telangiectasias Visible keratosis Wrinkles even when not moving	50+	Wears heavy foundation
IV	Yellow-gray skin color Prior skin malignancies Wrinkled throughout No normal skin	60s–70s	Can't wear makeup—cracks or cakes

the time of rhytidectomy. The resurfacing procedure, CO_2 laser, TCA peel, or otherwise, cannot be done on top of the undermined skin flap. In these situations, lines of demarcation or certainly changes in skin tone can be very evident in the preauricular areas and neck versus the treated midfacial regions.

Preoperative Skin Preparation

Preoperative topical therapies are used by most treating physicians to help maximize resurfacing techniques.[9,10] Tretinoin and glycolic acid are the most commonly used agents preoperatively and are utilized for their exfoliative and rejuvenating effects to improve the skin's response to ablative wounding. Tretinoin increases metalloproteinase, collagen synthesis, fibronectin synthesis, decreases collagenase, and stimulates fibroblasts, and epidermal mitotic activity.[11] Glycolic cream decreases the thickness of the stratum corneum, increases epidermal thickness, increases collagen, and increases glycosaminoglycans.[11] Also, a preoperative course of topical hydroquinone or hydroquinone mixtures (i.e., tretinoin, hydroquinone, and hydrocortisone) can help to reduce the risk of postoperative hyperpigmentation in those patients with darker complexions.[8,12] Hydroquinone inhibits tyrosine, therefore, increasing melanosome degradation and decreasing the formation of melanin.[11] We recommend a 4 to 6-week pretreatment schedule that incorporates exfoliation, healing, and bleaching/blending compounds.

Rhytidectomy Technique

Meticulous incision planning and marking are crucial for consistent, reliable results as well as patient satisfaction. Avoiding changes in the hairline and visible scars are important patient expectations and will affect patient satisfaction. The senior author's technique for the extended superficial muscular aponeurotic system (SMAS) rhytidectomy, including incision planning, has previously been described in detail, but relevant points will be highlighted.[13]

The beginning of the facelift operation requires treatment of the neck first, before the superior and posterior advancement, and suspension of the SMAS. Treating the fatty tissues of the jowl, submentum, submandibular region, and neck sets the stage for proper contouring of the neck and jaw line with the treatment of the SMAS tissues. Addressing the neck begins with a submental incision, submental, submandibular, and/or jowl liposuction (►**Fig. 1**), wide undermining of the neck skin in the subcutaneous plane (►**Fig. 2**), and

Fig. 1 Liposuction of the neck.

Fig. 2 Undermining of neck skin in subcutaneous plane.

anterior cervical platysma plication using the senior author's previously described Kelly-clamp technique.[13]

At this point, the facelift is performed. Incisions and areas of undermining are marked (►**Fig. 3**). After temporal, preauricular, and postauricular incisions have been beveled appropriately, skin flap elevation can be performed. Elevation of the postauricular skin flap is performed first. Dissection begins deep to the hair follicles and superficial to the fascia of the sternocleidomastoid muscle and then turns more superficial until it is in the immediate subcutaneous plane. Using Kahn-beveled facelift scissors in an advance-spread technique with the tips up assures that the dissection is in the proper plane within the subcutaneous fat. This dissection can be carried further to connect to the previously elevated neck skin flaps if necessary.

Preauricular skin elevation then is begun at the level of the helical insertion in the subcutaneous plane (►**Fig. 4**). Initial dissection begins beneath the hair follicles of the sideburn and then extends out in the subcutaneous plane to the lateral orbital crow's feet region. This dissection can be done safely in the subcutaneous plane without risk of injury to the frontal branch of the facial nerve coursing just beneath this level of dissection. As long as one preserves the layer deep to this where the frontal branch of the facial nerve courses within the SMAS plane, there is no risk to the frontal branch of the facial nerve. The elevation is continued approximately 4 cm to a maximum of 5 cm in the preauricular region and connected to the elevated neck and postauricular flaps. Dissection is less extensive anteriorly in the patient who is going to undergo CO_2 or TCA chemical peel resurfacing at the conclusion of the facelift procedure. One cannot treat the undermined skin with significant resurfacing techniques. Therefore, the skin elevation is more limited than in a standard extended SMAS facelift.

An incision then is made in the SMAS extending along the inferior border of the zygomatic arch at the malar eminence then diagonally down to the level of the earlobe and continuing inferiorly 1 cm in front of the anterior border of the sternocleidomastoid (►**Fig. 5**). The first 2 to 3 cm of SMAS elevation is performed with horizontal scissor dissection. Further elevation of the SMAS is performed by spreading the scissors in a more vertical fashion, directly visualizing tunnels and bridges as the dissection is carried anteriorly. The SMAS is carefully elevated, and dissection is carried 3 to 4 cm underneath the platysma. Above the mandibular margin, dissection is continued superficial to the masseter muscle over the premasseteric fascia. In selected patients, the mandibular-cutaneous ligament is released. Dissection then is begun in the malar region above the zygomatic buttress in the subcutaneous plane extending just inferior to the orbicularis muscle. This dissection requires the release of strong dermal attachments to the malar eminence in most but not all patients. Some control of bleeding often is required. Elevation then is extended easily superficial to the level of the zygomaticus muscle and into the midcheek region if necessary. This allows for "revolumization" of the malar cheek without adding autologous fat or other volumizing materials (►**Fig. 6**).

Individualization of the extent of midcheek SMAS undermining is important. Not all patients require full SMAS elevation of the midcheek, as has been reported for the standard deep plane facelift. Once good mobilization of the jowl and malar eminence has been accomplished, a complete elevation transition from deep to superficial to the

Fig. 3 Planned rhytidectomy incisions.

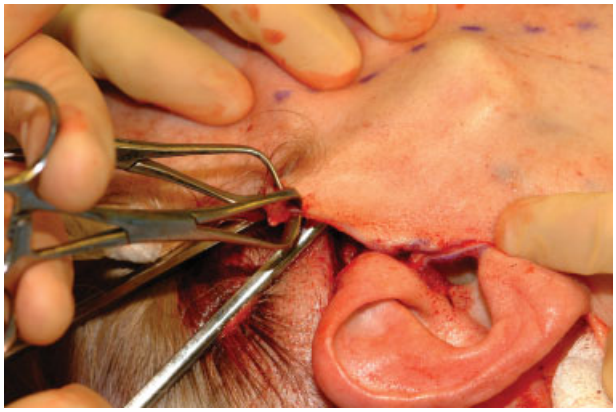

Fig. 4 Preauricular skin undermining deep to hair follicles and then in the subcutaneous plane.

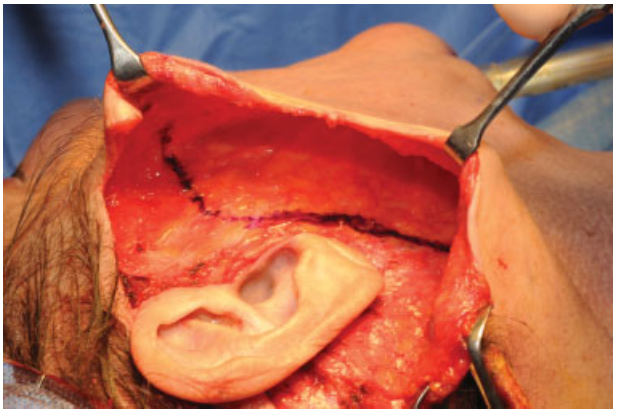

Fig. 5 Planned incision of the SMAS at the zygomatic arch and along the anterior border of the sternocleidomastoid muscle. SMAS, superficial muscular aponeurotic system.

Fig. 6 (**A**) Preoperative patient with midface volume loss, diffuse superficial rhytids, and photodamage. (**B**) Postoperative extended SMAS rhytidectomy with vertical lift and suspension to create midface enhancement and volumization. The patient also underwent simultaneous full face CO_2 laser resurfacing. SMAS, superficial muscular aponeurotic system.

zygomaticus muscle is not required. Modifying the deep plane technique decreases the risk of injury to the zygomatic and buccal branches of the facial nerve.

At this stage, the suspension of the midface and jowl tissues is accomplished by advancing the SMAS-subcutaneous skin unit in a superior and slightly posterior direction (►**Fig. 6A–C**). The primarily vertical lift of the SMAS is key to the rejuvenation of the midface and jowl. Because there are significant skin-dermal adipose-SMAS fibrous connections, the mobilization of the SMAS provides a tremendous lift and improvement of the lower and midface. Also, the soft tissues of the midface are elevated in continuity with this compound unit. The superior triangular portion of the SMAS is advanced, and Metzenbaum scissors are used to incise the redundant preauricular portion of the SMAS. The superior portion of this SMAS is left intact and is suspended to the dense preauricular zygomatic fascia at the level of the helical insertion with a deep, buried 0 Vicryl suture (Ethicon Inc.). Occasionally, a secondary support of one 3–0 Tevdek suture (Teleflex Medical OEM) is used in a patient who has a heavy cheek. Attention then is directed toward the overlapping platysma-SMAS at the level of the earlobe. Metzenbaum scissors are used to incise this tissue so a posterior–inferior portion of platysma-SMAS can be suspended intact to the mastoid fascia with a 0 Vicryl suture. This maneuver "hangs" or suspends the platysma as a sling from the mastoid, creating a firm corset across the midline to the opposite side.

Some redundant fatty tissue and SMAS overlapping the lower portions of the sternocleidomastoid are trimmed to avoid extra lumpiness in this area. Then, 3–0 monocryl sutures (Ethicon Inc.) are used to reinforce the platysma-SMAS to the posterior mastoid-sternocleidomastoid fascia. The preauricular area is also trimmed and sutured end to end with 3–0 monocryl sutures to complete the SMAS imbrication.

At this stage, the skin is advanced and redraped over the auricle in a more posterior vector. Only 3 to 4 cm of undermined skin remain in the preauricular region. The skin from the neck is advanced to the posterior mastoid hairline region, and then it is rotated superiorly, ensuring the recreation of the postauricular hairline and avoiding step-off deformity. Often there is 3 to 5 cm of excess skin excised. The hair-bearing portions are trimmed and reapproximated with staples. A bulb suction drain is placed in the neck portion of the wound. The preauricular skin is moved in a posterior direction mostly (rather than superior) to avoid any undue movement of the temporal hairline or bunching or pleating of the pretemporal–lateral orbital skin. The skin is trimmed judiciously in the preauricular area, ensuring that the earlobe is cradled in a superior fashion to avoid a Satyr's ear deformity (or pixie ear deformity) and a migrating scar in this region.

The tragal flap is designed to be extremely redundant to avoid any tension on the tragal skin. The skin is thinned judiciously to avoid overthinning and loss of viability. It is sutured in a running interlocking fashion with a 5–0 plain catgut suture. The closure of the temporal hair-bearing portion of the skin is performed by incrementally excising the redundancy within the hairline. The scalp then is approximated with interrupted staples. Two permanent 6–0 nylon sutures are placed at the earlobe and left in place for 10 days. The remainder of the skin closure is performed with catgut sutures (which either dissolve or are removed at 1 week).

Resurfacing Techniques

Fractionated Carbon Dioxide Laser

The main indications for CO_2 laser resurfacing include moderate-to-severe photodamage, moderate atrophic scars, diffuse lentigines, mild dermatochalasis, and various epidermal and dermal lesions.[2] Preoperatively all patients undergo facial cleansing with Septisol (Sandent Co.). In the combined rhytidectomy and laser resurfacing technique, the rhytidectomy is performed first. For fractionated CO_2 laser resurfacing, the authors use a Lumenis Encore Ultrapulse 5000 (Coherent Inc.). There is an ActiveFX handpiece—1.3 mm spot size, superficial, low density, ablative and a DeepFX handpiece—0.12 mm spot size, deep, fractionated. The DeepFX handpiece corresponds to a deeper treatment with narrower ablation compared with the ActiveFX that has a wider ablative spot size but not as deep penetration into the skin. Most often, the two handpieces are used concurrently to achieve superficial and deep results. The DeepFX is used on the treatment area for one pass followed by the ActiveFX for one pass. The recommended settings from the company and those settings used by the senior author for ablative resurfacing are depicted in ►**Tables 3** and **4**. These laser settings are determined by the area treated and severity of photodamage and the degree of rhytidosis. The laser is performed across the full face, but exceptional care must be taken to avoid deep lasering or fractionated lasering over the preauricular undermined skin flaps (►**Fig. 7**). Light ActiveFX or superficial ablation can only be done for blending purposes with safety. Density would be two, and the

Table 3 Fractionated carbon dioxide ActiveFX laser settings by patient characteristics

Treatment	Energy (mJ)	Scan size (mm)	Density	Hertz	Repeat delay (s)	No. of passes
PigmentFX facial	80–125	6–7	2–3	100–150	0.3–1.5	1
Moderate[a] photoaging/facial	80–125	6.7	2–3	100–150	0.3–1.5	1
Severe[a] photoaging/facial	100–125	6–7	2–3	100–200	0.3–1.5	1–2
Skin types IV–VI/facial	70	5–6	1–2	75–100	0.3–1.5	1

[a]As per Glogau classification.
Note: ActiveFX (Coherent Inc.).

Table 4 Fractionated carbon dioxide DeepFX laser settings by facial aesthetic unit

Treatment	Energy (mJ)	Scan size (mm)	Density (%)	Hertz	Repeat delay (s)	No. of passes
Deep wrinkles/facial	15–22.5	10	5–10	300–400	0.3–1.5	1
Periorbital excluding pretarsal area	10–17.5	10	5–10	300–400	0.3–1.5	1
Perioral	15–20	10	5–15	300–400	0.3–1.5	1
Surgical scars	17.5–22.5	10	10–15	300–400	0.3–1.5	1–2

Note: DeepFX (Coherent Inc.).

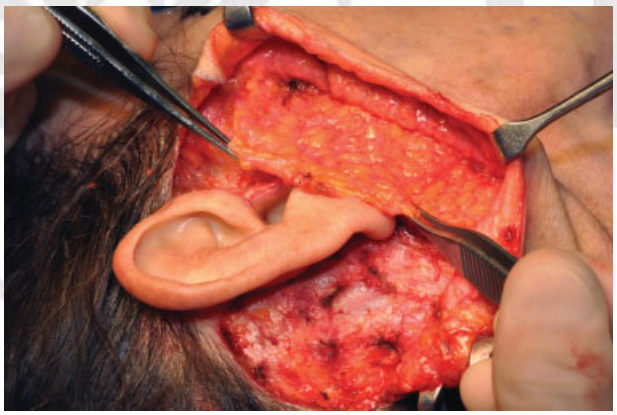

Fig. 7 Advancement of the SMAS in the vertical and slightly posterior direction. SMAS, superficial muscular aponeurotic system.

maximum fluence would be 60 to 70 mJ. For acne scars of the midcheek and other surgical or traumatic scars, and dramatic scars, the senior author may use TotalFX treatment which includes DeepFX and ActiveFX settings (►**Table 5**) or SCAAR FX in the areas of the scars, as long as they are not in the areas of undermined skin (►**Fig. 8**).

A 2 to 3 cm area of preauricular skin is left untreated by the senior author. However if desired the surgeon may "taper" over the area corresponding to the subcutaneous skin elevation with lower settings (►**Fig. 9**). Once the first pass is made, there may be some immediate punctate bleeding. The surface eschar and any blood should be gently wiped and removed with wet and dry gauze (►**Fig. 10**). The surface must be dried before continuing with a CO_2 laser as surface water absorbs the energy. A second pass may be directed to areas of deeper wrinkles, such as the glabella,

Table 5 Fractionated carbon dioxide TotalFX laser settings by condition

Treatment	Energy (mJ)	Scan size (mm)	Density (%)	Hertz	Repeat delay (s)	No. of passes
DeepFX						
Acne	15–20	10	10–15	300–400	0.3–1.5	1
Rhinophyma	20	10	10–15	300–400	0.3–1.5	1
Surgical scars	12.5–22.5	10	5–15	300–400	0.3–1.5	1
ActiveFX						
Acne	100	7	3	100–150	0.3–1.5	1
Rhinophyma	100–125	6	2	125	0.3–1.5	1
Surgical scars	80–125	7	1	100	0.3–1.5	1

Note: ActiveFX and DeepFX (Coherent Inc.).

Fig. 8 Identify the undermined preauricular skin flap which is the limit of full fluence CO_2 laser treatment.

Fig. 9 Completed extent of CO_2 laser resurfacing with blending over facelift flap and jawline.

Fig. 10 Wiping off superficial "eschar" or epidermal debris.

crow's feet, and perioral region and should be performed at settings in ►**Tables 3** and **4**.

Before the Lumenis fractionated CO_2 laser system with DeepFX and ActiveFX, the senior author performed many rhytidectomies with the UltraPulse ablative CO_2 laser. The settings for the UltraPulse ablative CO_2 laser (Coherent Inc.) were a maximum of 80 mJ and a density of 5, tapering to a density of 4 in the periorbital areas. Any ablation over the undermined skin was blended and feathered to a density of 4 and no higher than 60 mJ.

The CO_2 laser causes photothermal wounding with wide coagulation and necrosis with immediate collagen shrinkage.[2] There will be immediate visible tightening to the skin surface. Punctate dermal bleeding can be visualized. However, this is often minimal with the CO_2 laser due to thermal coagulation. A chamois color in any area signals the papillary or upper reticular dermis.[2] This should signal the endpoint to the surgeon. Because the senior author traditionally avoids any laser treatment over the undermined preauricular flap, there may be a postoperative demarcation in this area that fades and blends with time (►**Fig. 11A, B**). At a later date, the patient may return to the operating room for staged laser treatment of the preauricular skin flap. Pre- and postoperative pictures are seen in ►**Figs. 12–15**.

Chemical Peel

Phenol 88% and 35% TCA pretreated with Jessner's solution are considered medium depth resurfacing techniques with penetration to the papillary dermis and to the upper reticular dermis. Dermabrasion is considered a deep resurfacing technique to the midreticular dermis and is reserved for perioral rhytids and midcheek acne scarring. When rhytidectomy is combined with resurfacing and chemical peels, 35% TCA peel cannot be used over the extensively undermined neck or preauricular skin flaps. Therefore, the senior author blends at the jawline into the neck or full face chemical peel resurfacing is staged for a second procedure.

Fig. 11 (**A**) Preoperative patient with the descent of midfacial tissues, jowling, superficial rhytids, and solar lentigines. (**B**) Postoperative rhytidectomy, forehead lift, upper and lower blepharoplasty, full face CO_2 laser resurfacing, phenol chemical peel to the lower eyelids, and crow's feet. Note residual pigmentation and dyschromia in preauricular undermined rhytidectomy flap not treated.

Fig. 12 (**A**) Preoperative patient with the descent of facial tissues, jowling, facial rhytids, and solar damage. (**B**) Postoperative rhytidectomy, forehead lift, upper blepharoplasty, subnasal lip lift, lower lip advancement, full face CO_2 laser resurfacing, and dermabrasion to the upper lip.

Fig. 13 (**A**) Preoperative patient with solar lentigines, full facial rhytids, and laxity of neck tissues. (**B**) Postoperative rhytidectomy, forehead lift, upper and lower blepharoplasty, bilateral mid-forehead brow lifts, and simultaneous full face ablative CO_2 laser resurfacing.

Fig. 14 (**A**) Preoperative patient with deep acne scars on cheeks and chin. (**B**) 15-month postoperative full face TotalFX (Coherent Inc.) with dermabrasion to cheek and chin acne scars.

Fig. 15 (**A**) Preoperative patient with the descent of facial tissues, jowling, and neck skin laxity. (**B**) Postoperative rhytidectomy with full face CO_2 laser resurfacing.

TCA chemical peel (35%) pretreated with Jessner's solution is significantly milder than most CO_2 laser resurfacing ablative techniques and often fails to reduce facial, eyelid, and periorbital rhytids satisfactorily. Phenol 88% as a medium to medium-deep chemical peel is an excellent modality for lower eyelids. The senior author can achieve more consistent and better results with a single phenol 88% chemical exfoliation compared with CO_2 laser resurfacing. Pre- and postoperative pictures are seen in ►**Figs. 16–18**.

Erbium Yttrium-Aluminum-Garnet Laser

The main indications for erbium yttrium-aluminum-garnet (Er-YAG) include mild photodamage, mild atrophic scars, mild dyspigmentation, refractory melasma, and various epidermal and dermal lesions.[2] Using a variable pulsed Er-YAG system (Contour, Sciton), the technique begins with a 4 mm scanner resurfacing handpiece calibrated to the 100 µm depth and a 50% spot overlap. This initial resurfacing pass is used to treat the full face except for upper and lower eyelids and preauricular skin flaps, similar to the CO_2 laser. Lower settings are used for the eyelids and preauricular skin flap region.

The handpiece is then changed for fractionated vertical wounding using an erbium profractional scanner to treat all areas. For fractionated wounding, the preauricular area is spared. Although the preauricular area can be treated and has been described as treated to within 2 mm of the incision line by Alster et al,[2] the senior author prefers to leave the immediate 2 to 3 cm of undermined tissue untreated.

When using the Er-YAG laser, the surgeon will notice a significant amount of bleeding from the surface. This is a major difference between the use of the Er-YAG and CO_2 laser. Any oozing should be wiped clear before treating the area to avoid untreated areas or overtreating an area. Pre- and postoperative patients are seen in ►**Figs. 19** and **20**.

Resurfacing Technique and Decision Making

If there are significant solar lentigines or dyspigmentation over the undermined rhytidectomy preauricular skin flaps, there will be a significant line of demarcation with chemical

Fig. 16 (**A**) Preoperative patient with the descent of facial tissues, jowling, and solar lentigines. (**B**) 6 months postoperative rhytidectomy, upper blepharoplasty, endoscopic brow lift. (**C**) 8 months postoperative full face, neck, and chest TCA peel, Sciton laser with profractional laser to the upper lip.

Fig. 17 (**A**) Preoperative patient with the descent of facial tissues, jowling, full facial solar damage and solar lentigines. (**B**) Eight weeks post op rhytidectomy, endoscopic forehead lift, upper and lower blepharoplasty with TCA chemical peel of face, neck, and chest.

Fig. 19 (**A**) Preoperative patient with superficial rhytids and solar damage, the descent of facial rhytids, neck skin and tissue laxity (**B**) 2 years postoperative rhytidectomy, forehead lift, upper and lower blepharoplasty and full face combo Sciton laser resurfacing and Erbium/CO2 profractional ablation.

Fig. 18 (**A**) Preoperative patient with diffuse photoaging, neck skin laxity and fullness, and aging changes of the forehead and periorbital area. (**B**) Postoperative rhytidectomy, forehead lift, upper and lower blepharoplasty, simultaneous TCA peel, augmentation of lips, prejowl implant, a chin implant.

Fig. 20 (**A**) Preoperative patient with jowling, solar pigmentation, and neck skin laxity. (**B**) Postoperative rhytidectomy with full face Sciton profile laser (Contour, Sciton) resurfacing with fractionated and ablative erbium laser and dermabrasion to upper lip vermillion.

Fig. 21 (**A**) Preoperative patient with diffuse face and neck photoaging, the descent of midfacial tissues, jowling, and neck skin laxity. (**B**) Postoperative rhytidectomy with staged TCA chemical peel used to blend and treat photoaging of neck with CO_2 laser resurfacing of the face.

Fig. 23 (**A**) Preoperative patient with acne scarring, photoaging, jowling and neck skin laxity. (**B**) Postoperative rhytidectomy, full face CO_2 laser, and 88% phenol chemical peel to lower eyelids, dermabrasion to bilateral cheeks for acne scarring. Alternatively, using deep (550–850 μm) fractionated erbium laser in areas of acne scarring may be of equal or better benefit.

peels and laser resurfacing performed at the same time as the rhytidectomy. Therefore, in these patients, it is recommended to stage the resurfacing procedures (►**Fig. 21**). If the main concern is perioral rhytids or central facial pigmentation or rhytids, it is recommended to combine the rhytidectomy with the resurfacing technique. In particular, perioral rhytids are well treated with a combination of laser resurfacing and dermabrasion. Dermabrasion represents the single best one-time treatment of grade III to IV perioral and upper lip rhytids. Often, multiple resurfacing modalities will be used on a patient to best target and treat different superficial issues (►**Figs. 22** and **23**).

Postoperative Care

Preoperatively, patients are counseled to plan for 7 to 10 days of healing time for the facial skin, sometimes extending into 11 to 12 days in certain deeper treated areas. Immediately postoperative laser resurfacing, an occlusive dressing is applied for approximately 7 days. For fractionated laser resurfacing, Aquaphor is used to cover the entire laser treatment area (Beiersdorf Inc.). For fractionated CO_2 laser resurfacing, we begin immediate acetic acid soaks (2 3/4 cups water and 1/4 cup white vinegar) twice a day in addition to four a day facial cleanings with water-soaked gauze to remove crusting. Acetic acids soaks are only recommended for any CO_2 or erbium laser resurfacing. Dilute acetic acid will help to debride the crusting and provide an antibacterial function.[11] They are not used for TCA chemical peel treatments. The senior author may also use a Silon-TSR dressing (Bio-Med Sciences) to the full face for ablative resurfacing (►**Fig. 24**). However, the Silon-TSR dressing is not recommended for resurfacing that causes significant bleeding and crusting under the dressing.

All rhytidectomy dressings and drains are removed postoperative day one (►**Fig. 25**). The rhytidectomy incisions are cleaned with hydrogen peroxide and coated with bacitracin ointment four times a day. The wound care regimen is continued until reepithelialization has usually been achieved at 7 to 10 days postoperatively. We encourage patients to shower frequently to assist with the cleanings as the steam and water are helpful for removing all of the facial crustings.

Fig. 22 (**A**) Preoperative patient with facial photoaging, superficial rhytids, neck skin laxity, and banding. (**B**) Postoperative rhytidectomy with full face CO_2 laser, 88% phenol chemical peel to lower eyelids and dermabrasion to lip vermillion.

Fig. 24 Silon-TSR dressing (Bio-Med Sciences) applied over full facial laser resurfacing.

Fig. 25 Silon-TSR (Bio-Med Sciences) dressing applied over full facial laser resurfacing with rhytidectomy dressing and drains.

Once complete reepithelialization has occurred, usually between 8 and 12 days postoperatively, application of anti-inflammatory cream should be initiated with a nonfluorinated steroid, such as mometasone. For areas of delayed healing, an occlusive hydrocolloid dressing may be placed and changed every 2 to 3 days until epithelialization is complete. A skin care and make-up consultation is done on postoperative day 10 to transition the patient off of Aquaphor to a thick moisturizing cream. Postoperatively it is imperative that the patient avoids direct sun exposure and uses sunscreen with a sun protection factor (SPF) 45 or higher every day to avoid dyspigmentation or postinflammatory hyperpigmentation. As long as the areas are red, the patient needs to avoid direct sun exposure for 4 to 6 weeks.

Complications of Combined Rhytidectomy and Laser Resurfacing

Prolonged Erythema

Reepithelialization after CO_2 or Er-YAG laser occurs in approximately 7 to 10 days.[2] Erythema is expected after laser resurfacing. It may be 3 to 6 months following CO_2 and only 2 to 4 weeks following Er-YAG because CO_2 causes more thermal necrosis in the dermis compared with Er-YAG.[2] The risk for prolonged erythema is increased with CO_2 laser resurfacing, increased number of passes, stacking pulses, tretinoin or glycolic acid use and underlying rosacea.[2] Prolonged erythema is treated with strong class I topical corticosteroid for intense erythema.[2]

Acne Outbreak/Dermatitis

Acne outbreaks may occur approximately 1 to 3 weeks after laser resurfacing if prone to acne and may occur greater than 6 weeks later if not prone to acne outbreaks.[2] Acne outbreaks may be treated with tetracycline, erythromycin, or minocycline. The senior author has had the best results with a short course of erythromycin, 250 mg, 4 times a day, for 10 days in this situation. The skin may experience irritant dermatitis from topical creams or ointments following laser resurfacing. Treatment includes stopping the irritant and limiting the topical dressing to Aquaphor or plain petroleum. Cold compresses, antihistamine, oral steroids, and a mild topical corticosteroid may be helpful as well.[2]

Infection

The most common viral infection after laser resurfacing is herpes simplex virus (►**Fig. 26**). Despite prophylaxis, 2 to 7% of patients will experience a herpetic outbreak according to Alster et al.[2] The senior author, however, has found that no patients have herpetic outbreaks with proper prophylaxis using 800 mg of acyclovir orally three times in a day starting 4 days preoperatively and continuing for a solid 2 weeks postoperatively. If the patient follows this regimen, he/she will not have an outbreak of herpes simplex virus. If a patient experiences an outbreak, a recommended treatment dose is acyclovir 800 mg five times in a day or valacyclovir/famciclovir 500 mg three times in a day.[2] The most common bacterial infection is streptococcus, staphylococcus, and pseudomonas.[2] Bacterial infection may be prevented by acetic acid soaks and frequent occlusive dressing changes. The authors' perioperative routine includes prophylactic antibiotic dosing with a first generation oral cephalosporin for a combined rhytidectomy and laser resurfacing technique and rhytidectomy alone.

Postinflammatory Hyperpigmentation and Hypopigmentation

The most common adverse effect after laser resurfacing is postinflammatory hyperpigmentation, which can be seen in 33% of patients[2] (►**Fig. 27**). A mild degree may be seen in the first month but will resolve by 3 months. Topical hydroquinone cream and topical steroid after 1 month (a steroid to decrease irritation) and sunscreen of SPF 45 or greater will help to treat the dyspigmentation. Preoperative skin preparation with tretinoin and hydroquinone will not prevent this type of deep postinflammatory hyperpigmentation because these topical treatments cannot reach to the deep dermal melanocytes from which the problem arises.[2]

Hypopigmentation can be seen greater than 6 months following laser resurfacing, usually, 6 to 12 months.[2] Treatment includes glycolic acid 30 to 40% peel with a light 15% TCA peel to blend.[2] Makeup will also help to cover and blend this type of dyspigmentation.

Fig. 26 Herpetic outbreak in a patient not treated with acyclovir.

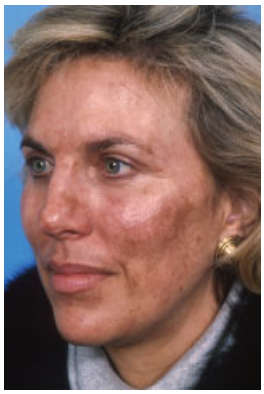

Fig. 27 Postinflammatory hyperpigmentation can commonly occur with medium depth resurfacing if not pretreated with hydroquinone.

Flap Necrosis

Skin slough after rhytidectomy has been reported at 1.1 to 3%.[14] Various animal models have shown flap necrosis and deleterious effects of laser treatment. However, those studies used higher settings with multiple passes.[15–17] Therefore, the authors recommend safe settings in ►**Tables 3–5**. When combining rhytidectomy with CO_2 or Er-YAG laser resurfacing, there is a risk of irreversible injury to the undermined thin skin flap. In a meta-analysis, Koch and Perkins[3], as well as several other authors, reported that the percentage of complications (flap loss and skin slough) in simultaneous modalities were no different from those of rhytidectomy alone.[18,19] Alster et al[2] and Weinstein et al[20] compared various ablative modalities including Er-YAG laser in the setting of concurrent rhytidectomy without an increase in complications or skin slough.

Hematoma

A hematoma is the most common complication following rhytidectomy. Hematomas are more common in males due to increased vascularity of the skin flaps in the beard distribution. The incidence in the literature varies from 2 to 15%, with the senior author's experience ranging from 1 to 2% incidence of hematoma with the use of closed suction bulb system drains postoperatively.[13,21] When patients present with a small postoperative hematoma, management includes observation or needle drainage. For a very large, rapidly expanding hematoma, emergent surgical evacuation with aspiration is necessary. In the senior author's experience, this occurs in approximately 1 in 100 to 150 rhytidectomy patients.

Conclusion

Simultaneous rhytidectomy and full-face laser resurfacing are a safe and effective treatment to refresh and recreate the neck and jawline angles while also improving skin photodamage. The two treatments have a similar recovery time and therefore are easily performed together when considering patient recovery and downtime. As technology improves, we will likely see an expansion of laser technology for antiaging purposes, decreased downtime without compromising results, and increased safety. A thorough understanding of a patient's expectations, precision surgical technique, and a well-educated patient on the postoperative care can make for an exceptional experience for both the patient and surgeon.

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