Despite the cardinal role played by perioral aesthetics in facial pulchritude or youthful appearance, minimal attention has been paid in the literature to correcting dysmorphologies of this region. There are two categories of patients who seek aesthetic improvement in the perioral area. In the younger patient, lip augmentation, lip shortening, or lip elongation can be applied singularly to enhance and harmonize the appearance of this area. In the older patient, skin changes (including dynamic and static lines), the tilt of the oral commissures, and lip ptosis all play a major role. Aging also may result in dyschromias. Volume loss and gravity can lead to an exaggerated depth of the nasolabial creases or marionette lines. The lips become thin, losing “crispness” in their white roll and philtral columns, and the surrounding skin loses its subcutaneous fat, allowing accentuation of the fine wrinkles resulting from repetitive orbicularis oris action. Ptosis of the malar fat pads lateral to the nasolabial creases combined with thinning of the skin over the creases draws attention to the aging perioral area, making depth over the nasolabial crease an issue to contend with during treatment.1

Because traditional rhytidectomy techniques often do not sufficiently address the perioral area, patients may be disappointed postoperatively about an imbalance of the face or insufficient improvement. Recognizing the changes that occur with aging in the perioral area and subsequently exercising the options available to rejuvenate the lower face are necessary to providing optimal facial harmony. In this article, we discuss the etiologies behind the dysmorphologies in this area and presents a problem-oriented algorithm for treating them.
tissue fillers, fat grafting, skin resurfacing, or some combination of these techniques. The perioral region is bounded by the nasolabial creases superolaterally, the labiomental crease caudally, and the nasal base cephalically. Anatomical landmarks of this region include the philtrum, philtral columns, philtral dimple, Cupid’s bow, vermilion border, nasolabial crease, and labiomental crease (Figure 1). The lower third of the face is divided again into thirds, with the upper one-third extending from the subnasale to the stomion and the lower two-thirds extending from the stomion to the menton. The oral commissure lies within a vertical plane drawn from the medial limbus of the iris. The lips should meet on repose. A key anatomic feature of the upper lips is the Cupid’s bow complex, formed by two high points of the vermilion joined by a V-shaped depression centrally. The lower lip shows fullness in the central portion. The white roll is prominent in youth.

The muscles of the perioral region are arranged in distinct patterns, and there are various classification systems. Nairn’s classification divides them into three groups based on attachments to the lip. Group I muscles enter the modiolus, which is the area of convergence for the tendinous fibers of muscles entering the lip. Group II muscles enter the upper lip, and Group III muscles enter the lower lip. The orbicularis oris, levator anguli oris, depressor anguli oris, risorius, zygomaticus major, incisivus superioris, incisivus inferioris, and buccinator muscles comprise the Group I muscles. Group II muscles enter the upper lip as a flat sheet, and their fibers run at right angles to the fibers of the orbicularis oris. These muscles include the levator labii superioris, levator labii superioris alaque nasi, and zygomaticus minor. Group III muscles include the depressor labii inferioris, mentalis, and platysma muscles. As a group, these function opposite to the way the Group II muscles work for the upper lip.

Sensory innervation of the upper lip comes from the superior labial and superior alveolar nerves, which are divisions of the infraorbital branches of the maxillary (V2) nerve. The mandibular (V3) divisions of the trigeminal nerve give rise to the inferior alveolar nerve, of which the mental nerve is the branch supplying the lower lip and chin. Blood supply is derived from the inferior and superior labial branches of the facial artery. The angular artery (off of the distal facial artery) extends along the pyriform aperture and gives off branches.

PERIORAL IMPERFECTIONS

A careful examination of the perioral region may disclose one or several flaws. The area should be examined thoroughly to catalog these deformities. First, although the majority of lip atrophy occurs with aging, hypoplastic lips can also be present in young patients. For these patients, the goal is to augment or increase volume. Second, patients could present with a descended stomion or elongated upper lip. Assessment of facial proportions is critical to identifying this imperfection. Third, it is important to make note of prominent radial wrinkling of both lips, which can be particularly noticeable on the upper lip. The physician should differentiate between dynamic lines (which appear only or mostly on animation) and static lines (which are present constantly). Fourth, patients may have a “downturned” or sad appearance to the creases and folds in the oral commissure area. Fifth, the depth of the nasolabial crease is important, and any asymmetry should be noted.

With the patient smiling, the amount of maxillary incisor show should also be checked. Again, an optimal amount of incisor show is 2 to 3 mm. Less tooth show is suboptimal, and more than 3 mm can be displeasing. The amount of tooth show changes with age, and an inadequate tooth show should be corrected to rejuvenate the face. Patients with excessive incisor show can be referred to as having a “gummy smile.” These patients expose a broad strip of maxillary gingiva above the teeth when smiling. This exposure could be due to excess maxillary length or may be the result of a short or hypoplastic upper lip. Correction of this exposure involves lip augmentation, maxillary intrusion osteotomy, or lip lengthening with or without augmentation, depending on the dysmorphology. Another cause of a gummy smile is hyperfunction of the lip elevators, which can be surgically corrected through lip elongation with or without rhinoplasty to correct the anterior nasal spine and depressor septi nasi muscles. Also, delayed passive eruption is a developmental problem of the teeth, which can result in an excess amount of gum covering the dental crown. This is particularly evident in dynamic motion. Gingivectomy and vestibuloplasty can correct this, and these are usually performed by a cosmetic dentist or oral maxillofacial surgeon.
After considering the patient’s aesthetic flaws, analyzing the patient’s face with a focus on the perioral area, and discussing the patient’s goals, the surgical options should be outlined according to the algorithm included in this article (Figure 2). The patient should be informed about what is surgically or procedurally possible.

**Surgical Corrections**

Direct Lip Lift (DLL)

In general, this technique is offered to the patient who is older than 50 years, has a long lip with inadequate incisor show, and has hypoplasia with ill-defined vermillion borders. Meticulous marking of the skin is critical for this surgery (Figure 3). The caudal incision is placed approximately ¼ mm cephalad to the existing vermillion border to maintain or restore a proper definition to this landmark.

With this technique, the lip is infiltrated with lidocaine with 1:100,000 epinephrine. The lip skin is then excised and undermined 1 to 2 mm. The incision is repaired with 6-0 Monocryl (Ethicon, Inc., Somerville, New Jersey) and 6-0 fast-absorbing catgut. The repaired incision is then treated with one pass of a CO₂ laser to minimize scar visibility. Complications of DLL include conspicuous scarring, asymmetry or limited lip motion as a result of scar contraction, and over- or undercorrection. The outcome of DLL is increased vertical height of the red lip, with decreased length of the upper lip and increased incisor show (Figure 4). One has to exercise caution when combining a lip lift with lip augmentation to avoid overcorrection.

Indirect Lip Lift (ILL)

This technique is suitable for the patient who has a long lip, inadequate incisor show, and a well-defined vermillion
border. Ideal patients are generally younger than 50. The ILL technique has the added benefit of allowing the maxillary teeth to reemerge both at rest and during smiling. By elevating the central portion of the upper lip and restoring tightness at the base of the nose, in the properly selected patient, this procedure can enhance the lip “pout.”

The technique relies on a variation of the double-curvilinear, “buffalo horn”-shaped incision at the nasal base, tapering to end at the nasoalar crease (Figure 5A). The senior author (BG) prefers to stop the incision at the lateral limits of the alar base (Figure 5B). For patients who lack a distinct nostril sill, the incision is extended into the nostril floor (Figure 5C). About 3 to 5 mm of skin is excised, depending on the amount of correction desired. There is no undermining of tissue, and the incision is closed in two layers with 6-0 Monocryl and 6-0 fast-absorbing catgut. This procedure can be performed without an incision in the columellar base. The complications of ILL include visible scarring, asymmetry, and wound dehiscence. A patient demonstrating excessive incisor show is depicted in Figure 6.

**RESURFACING**

Some patients exhibit fine wrinkles, either static or dynamic. The dynamic lines (known as “smoker’s lines” or radial pucker lines) are most prominent on the upper lips and are caused by orbicularis oris action over time. The dynamic lines are difficult to correct and may require release of the fibrous bands with an 18-gauge needle, addition of a string dermis graft, fat injection, and laser or dermabrasion (Figure 7). Fine static wrinkles are most effectively treated with ablative resurfacing techniques utilizing laser, dermabrasion, or deep chemical peels (Figure 8). Coarser static wrinkles can be treated successfully with a combination of dermabrasion and laser. Dermabrasion removes the epidermis and upper dermis with a slow- to medium-speed diamond fraise. Freezing the epidermis with ethylene chloride ensures uniformity in the level of dermabrasion.

In the senior author’s practice, the CO₂ laser is applied at the following settings: 100 mJ, a density of 5, and 60 W with the newer device, or 300 mJ with the older device. Two or three passes are made in the perioral region from the nasolabial creases to the menton, with feathering at the mandibular margin. Application of an occlusive dressing such as Laser-Seal (Innovative Wound Management, LLC, Cleveland, Ohio) reduces pain and redness, and it also induces rapid reepithelialization. There is also usually a modest lip lift from laser resurfacing and dermabrasion.

Complications of resurfacing procedures include hypopigmentation in patients with higher Fitzpatrick skin types. The hypopigmentation can respond to treatment with topical hydrocortisone and hydroquinone. This complication can also be minimized by proper patient selection. Persistent or prolonged erythema of the reepithelialized skin can occur, but demarcation of laser-treated areas can be prevented or reduced by feathering and proper technique selection. Hypertrophic scarring and contracture are the most serious complications of this operation. This complication can be treated by injecting a small amount of Kenalog 20 to 40 mg/mL (Bristol-Myers Squibb, New York, New York). The injections can be repeated every four to six weeks until the scar is flattened.

**LIP AUGMENTATION**

Patients who demonstrate excessive incisor show in repose, have excess gum show in animation, or have a hypoplastic lip are ideal candidates for lip augmentation. It is important to emphasize to the patient that complications can be more common with this procedure than with the average plastic surgery procedure, regardless of which technique is used. Although it is an extremely meticulous and unforgiving procedure, the results are often extremely gratifying.
An important aspect of lip augmentation is maintaining the “sensuous” feel of the lip. Soft lips have a significant role in intimate expression; therefore, the lips should feel as natural as possible once healing is complete. This is one of the major advantages of injecting autogenous materials. If autogenous material is used for augmentation, slight

Figure 5. The markings for an indirect lip lift with “buffalo horn”-shaped incisions are illustrated (A) and shown intraoperatively (B). In patients who lack a direct nostril sill, the excision is extended to the nostril floor (C).
overcorrection for dermal fat grafts and significant overcorrection for fat injection are essential to achieving the intended aesthetic objectives (Figure 10). There may be a protracted recovery time wherein patients’ lips would appear larger than desired. This is one of the drawbacks of autogenous injections but is not an issue with alloplastic materials. Furthermore, with autogenous techniques, the patient may require secondary procedures to correct minor imperfections.

Figure 6. (A, C) This 37-year-old man presented with excessive incisor show. (B, D) Five years after an indirect lip lift, the amount of incisor show was improved.

Figure 7. This patient, in her 50s, presented with upper lip shortening. (B) One year after full-face laser treatment with upper lip shortening.
Autogenous Materials

In the senior author’s practice, core fat grafts, segmental fat grafts, dermal fat grafts, and fat injection are commonly used. The subcutaneous fat attached to the lateral border of the superficial muscular aponeurotic system (SMAS), which is easily accessible in patients undergoing a rhytidectomy, is a natural source for grafts.\(^4,10\)

Microlipoinjection involves nontumescent fat harvest from the buttocks, hips, or abdomen. The senior author harvests the fat from these areas through a 1-mL syringe cut in a beveled fashion (Figure 11). The fat is injected with a Coleman blunt cannula (Mentor Worldwide LLC, Santa Barbara, California) into the areas that require enhanced volume.\(^1,11\) With fat injections, significant overcorrection is needed to account for partial absorption (Figure 12). Approximately 1.2 to 1.5 mL should be injected into the upper lip and 1.5 to 2 mL into the lower lip.

To place the dermal fat or lateral SMAS grafts for upper or lower lip augmentation, the oral commissure width is measured with the lips stretched. This measurement should match the size of the dermal fat graft, which is usually at least 10 to 11 cm in the upper lip and at least 10 to 12 cm in the bottom lip. With dermal fat grafts, the incision should be made in the suprapubic area or around an existing incisional scar. The area is then infiltrated with xylocaine containing 1:100,000 epinephrine. The lips are also injected with the same solution. A tunnel is dissected in the deep mucosal plane from one oral commissure to the opposite oral commissure with a pair of 4.5-inch (“baby”) Metzenbaum scissors. The dermal fat graft is harvested following deep epithelialization of the skin in situ (Figure 11). The skin incision is closed with 5-0 Monocryl (Ethicon, Inc.) and 5-0 fast-absorbing catgut.

If core fat grafts are utilized, the fat is harvested after the target area and the lower abdominal and paraumbilical region or buttocks have been injected with 0.5% lidocaine.
Figure 10. (A) This 68-year old man presented with hypoplaslic lips. (B) Nineteen months after lip augmentation with autologous fat grafts, as well as augmentation genioplasty and rhinoplasty.

Figure 11. (A) A modified tuberculin syringe holds fat harvested from the appropriate area (buttocks, hips, or abdomen), which can be used for autologous grafts in the desired area. (B) Dermal grafts.

Figure 12. (A) This woman, in her 30s, presented with hypoplastic lips and desired augmentation. (B) Early results are shown following dermal grafting for volume enhancement.
hydrochloride with 1:100,000 epinephrine. The tip of a 1-mL syringe is cut in an oblique fashion with a pair of strong scissors. A 5-mm stab incision is made within the inferior border of the umbilicus or within the buttock crease to provide access to the fat donor site. The oblique end of the syringe is introduced through the paraumbilical incision. The syringe is rotated and advanced forward while the piston is gently pulled, enough to accommodate the fat being harvested. Very little or no suction effect results from this action. It is the combination of rotation and advancement of the syringe with the surgeon’s dominant hand, accompanied by a gentle external squeeze with the nondominant hand, that delivers the fat into the syringe in a “boring”-type effect. A total of 1 mL of aspirate is removed with each entry. This delivery technique provides an almost en bloc fat graft that is placed into the recipient bed. A space is created in the recipient site in the same manner with either a pair of baby Metzenbaum scissors or the same syringe containing the fat. Approximately 10% to 20% overcorrection is needed. The operative incision site is closed with one or two 6-0 fast-absorbing catgut sutures.

Postoperative complications of lip augmentation depend on the application technique. The senior author has found that patients are generally very pleased with their outcomes after lipotransfer, and the results persist even after many years. Suboptimal results include irregularities or asymmetries due to uneven take or reduced tooth show. Functional limitations can also occur if the graft length is not initially designed to fit the lips when stretched. In these cases, there can be limitation of movement if the graft was harvested at less than 10 or 11 cm, which is the normal width of a fully stretched lip.

**Nonautogenous Injectables**

Nonautogenous soft tissue fillers come in many varieties. Collagen has been applied for lip augmentation for more than two decades. These injections are typically placed in the vertical vermillion border and the white roll with a 30-gauge needle. Hyaluronic acid (HA) has also gained significant popularity recently.3,4 HA is a highly hydrophilic glycosaminoglycan polymer naturally found in the body. Its hydrophilic nature allows support of tissue volume. Because this material is not species- or tissue-specific, there is almost no antigenic response. The size of the molecules varies, which is important to its clinical application. Currently, Restylane (Medicis Aesthetics, Inc., Scottsdale, Arizona), with its 400-µm particle size, and Juvéderm or Juvéderm Plus (Allergan, Inc., Irvine, California) are the preferred injectables for the vermillion border or white roll, the wet-dry junction, and the philtral columns of the upper lip. Perlane (Medicis Aesthetics, Inc., Scottsdale, Arizona) is also injected into the submucosa of the lips to restore volume.

Complications of soft tissue fillers can include granulomas, nodules, and cyst formation at the injection site, as well as asymmetry. These side effects can be minimized by massage, which helps to evenly distribute the filler material immediately postinjection. In addition, proper filler selection can eliminate the chances of patients developing nodules within the lips, which can be displeasing and sensitive. Any excess portion of HA can be dissolved with small injections of hyaluronidase.

**CONCLUSIONS**

Dysmorphologies of the perioral area have a variety of anatomical causes. Perioral rejuvenation, lip augmentation, lip rejuvenation, and lip shortening can all yield extremely gratifying results with proper technique and patient selection by restoring or enhancing the attractiveness of this area. Lip rejuvenation and shortening can also lend more uniformity to the rejuvenation achieved through facial rhytidectomy.

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