

Aesthetic Treatment Considerations for the Eyebrows and Periorbital Complex

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ABSTRACT

The periorbital complex is a critical cosmetic unit. Treatments for this region range from topical prescriptions to enhance the brow hair to topical cosmeceuticals that improve the tone and texture of the skin. Lasers, radiofrequency, botulinum toxins, fillers, and a host of other treatments are used to treat the periorbital region. Judicious use of these treatments, alone or in combination, can greatly alter the appearance of the region. However, adverse events may also be associated with these treatments, and the clinician and patients need to consider both the risks and the benefits of treatment prior to embarking upon a regimen.

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INTRODUCTION

The periorbital complex includes the eyelids, eyelashes, eyebrows, and bony structures that surround the eye. Aesthetic treatments for the periorbital region have been a cosmetic concern since the time of the early Egyptians, at which time various dyes were used to enhance the lashes and brows, and to accentuate the eyes. Since then, there has been significant progress. The advent of botulinum toxins for the treatment of glabella furrows heralded a new focus on this region, and at the present time botulinum toxin is the most popular minimally-invasive cosmetic procedure in the United States.¹ Soft tissue augmentation is used to renovate both the infraorbital region and the supraorbital region. Bimatoprost has been approved for the treatment of eyelashes, and recent publications have documented its efficacy for eyebrow hypotrichosis.² Radiofrequency and lasers have been used to both tighten and improve the quality of the skin, while topical cosmeceuticals have also been effective in some instances. The periorbital region is an important component of communication between individuals and is often the first area to show signs of aging. Patients thus often view it to be of socially significant concern.

DISCUSSION

Periorbital Aging

In order to understand what occurs in the periorbital region with aging, it is helpful to have some parameters of a youthful brow position and shape in a youthful face and to know how the soft tissue and bony structures of this area change with time. The eyebrows, composed of thick, pigmented terminal hair, not only protect against rain and sweat but also serve to express emotions, communicate, and contribute to differentiation between males and females.³ The eyebrows serve as a site for both frontalis insertion and interdigitation with the orbicularis

oculi. A fat pad exists in a split in the muscle sheath, allowing for eyebrow movement, and continues into the upper lid.⁴

In many people, the brow descends with age. This occurs as the elasticity of the forehead region decreases and the frontalis is no longer able to suspend the brow. With this descent of the brow, there is less suspension of the upper eyelid, which tends to droop. One study of the aging brow in Indian women found that, in the population studied, with age the lateral brow descended while the medial brow stayed relatively constant.⁵ These authors recommended "brow reshaping by restoration of the brow apex lateral to the level of the outer corneal limbus" as a goal for cosmetic rejuvenation of the periorbital area. This goal may be attained surgically provided that the patient is a candidate for surgery and amenable to the procedure. However, many patients prefer not to have this region addressed surgically if an alternative is available.

In addition to these changes noted in the soft tissue, there are significant changes in the bony structures of the periorbital region. A CT evaluation of 60 women and 60 men found a significant increase in the orbital width and aperture with aging,⁶ a change that was noted in both sexes and is thought to be one hallmark of the aging periorbital region. In addition to the profound changes that are seen within the bony structures of the periorbital region, there are other significant changes in the soft tissue, as well as in the fat and hair of these areas. A comparison of aging in the periorbital area soft tissue using CT scanning demonstrated that the soft tissue muscle volume in the periorbital area decreased in women but increased in men.⁷ These same authors found an increase of periorbital fat volume in women as they age. Another change that occurs with the aging brow is a decrease of the den-

sity and color of the eyebrow hair. This tends to shift the aesthetic focus away from the periorbital area.

Treatment Considerations

With the advent of botulinum toxins, lasers, energy devices, and lash and brow topical treatments, there are alternatives to surgery that allow impactful non-surgical approaches.

Botulinum Toxins

Type A botulinum toxin treatments remain a popular option for improvement of the periorbital complex. In the United States, there are 3 type A toxins approved for use in the glabellar region, but only one of these is approved for the treatment of the orbicularis oculi muscles. Injections of botulinum toxins may be used to raise or lower the brow. Injections into the depressor muscles of the glabella complex without treatment of the brow elevator (the frontalis) will enable the brow to elevate. This "brow lift" may be titrated based on patient anatomy to shape the brow and, to a lesser degree, the upper eyelid. This elevation may be further enhanced by injections of toxins into the depressor portion of the orbicularis oculi muscles.

Injections of onabotulinumtoxinA (Botox®) into the glabella region use 20 to 25 units of toxin to decrease the activity of the procerus and corrugator muscles. This same injection may be performed using abobotulinumtoxinA (Dysport™) by using 50 to 60 units of toxin, whereas the use of incobotulinumtoxinA (Xeomin®) for this treatment requires about 25 to 30 units. Use of the correct amount of toxin will not only help to decrease the appearance of vertical glabellar lines but also minimize the depressor component of the procerus, which will help to raise the brow to a more youthful appearance. These injections have been demonstrated not only to improve appearance, but also to improve self-esteem and lower the perceived ages of those treated.⁸⁻¹⁰ Optimal correction of static glabellar lines requires concomitant use of a hyaluronic acid (HA). The use of fillers combined with toxins not only helps to improve the appearance but also increases the duration of this correction.^{11,12}

Botulinum toxins may also be used to treat the lateral periorbital region to decrease the appearance of the so called "crow's feet". Injections into this area may use 40 to 60 units of abobotulinumtoxinA, 20 to 30 units of onabotulinumtoxinA, or 25 to 35 units of incobotulinumtoxinA to treat both sides. When injected properly, the wrinkles that surround the lateral periorbital region may be markedly diminished and the depressor component of the lateral orbicularis orbiti muscle may be minimized. This latter action enables the lateral brow to rise and helps to position the brow into a more youthful position (Figure 1). Injections of onabotulinumtoxin into the lower eyelid, 4 mm below the ciliary line, produced improvement of the lower lid rhytids; and it is likely that injections of other toxins into this area would yield similar results.¹³

FIGURE 1. The youthful periorbital region has the superior aspect of the brow directly above the lateral iris. There is no evidence of photodamage or laxity.

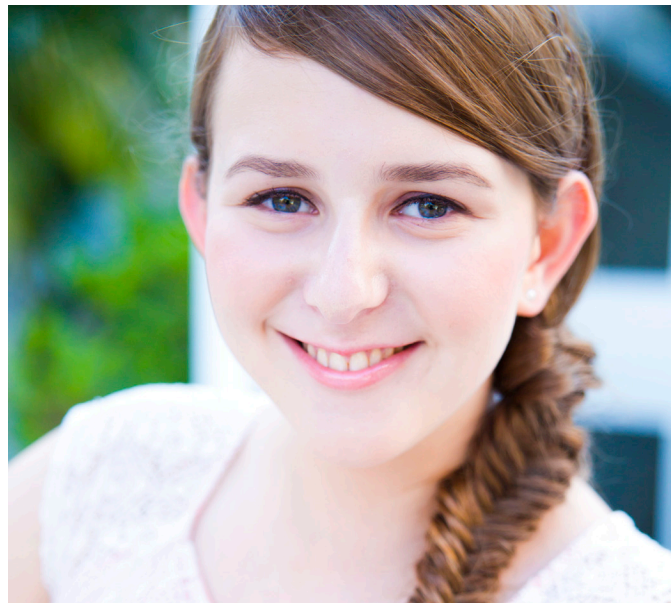


FIGURE 2. In the aging periorbital region, the brow and lid have descended, the lashes and eyebrow are more sparse and lighter in color, and the lid and periorbital skin have more rhytids and photodamage. Each of these issues may be addressed and corrected.



Lasers and Energy Devices

Devices that deliver energy to the skin of this region may also be used to alter the laxity of this area. Radiofrequency devices have been shown to tighten the skin of the brow as well as the skin of the lateral eyelid.^{14,15} Recently several other devices including ultrasound have been used to tighten the skin of this periorbital region.^{16,17} Lasers such as the carbon dioxide (CO₂) and erbium lasers may also be used to alter the laxity and the texture of the upper and lower eyelids.¹⁸⁻²⁰ The use of an energy-delivering device in this area requires a great deal of caution

and experience to avoid complications such as scarring, nerve injury, and/or ectropion.

As these devices have evolved, they have become more effective at producing meaningful results. For many patients, they may help significantly to improve the aesthetic appearance of the skin in this region. Carbon dioxide lasers have been demonstrated to improve the laxity and texture of the periorbital skin.²⁰ In addition to CO₂ lasers, ultrasound and radiofrequency are effective modalities to help tighten the skin of the periorbital area.²¹ Many different commercial devices are available, and both monopolar and bipolar radiofrequency devices are effective at tightening the skin in this area. Treatments for this area must be sensitive to the fact that high energy delivered by any device may result in complications including ectropion (especially seen with aggressive laser or chemical peeling) and nerve damage (transient) from radiofrequency.

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Soft Tissue Augmentation

Soft tissue augmentation of the periorbital region was initially advocated solely for the infraorbital zone. However, as techniques and materials have improved, injections into other areas such as the brow and temple have become more prevalent. A prominent tear trough may be genetically predisposed or may evolve as the mid-face and periorbital fat pads sag and the ligaments become lax. In order to improve the tear trough deformity, materials such as autologous fat and HA have been successfully used. Attempts to use other products such as poly-L-lactic acid or calcium hydroxylapatite have met with less success and these materials should not be injected into the tear trough. Materials such as Restylane[®], Juvederm[®], and Belotero[®] are used to fill the deformity and re-inflate the lower tear trough. When injecting these products, technique is critical. If the HA is not placed in a deep plane, one runs the risk of seeing the product reflecting light and having a Tyndall effect, whereby the material appears as a blue bleb.²² The correct plane to inject is the periosteal plane, below the orbicularis oculi muscle.

Injections should be conservative, especially in a patient who has not had prior treatment in this location. For the initial injection, it is reasonable to inject 1 mL shared between both sides. If there is a significant volume loss in the lateral compartment, a second mL may be injected. Injections of the tear trough should not transgress the orbital rim. To achieve optimal results, one should continue the injection of material laterally to support the

lateral trough. Injections into the radiating periorbital rhytids may be performed using small amounts of reconstituted HA products. This dilution of product will change the physical characteristics of the gel and may help to minimize the appearance of blue gel blebs.

Injections of HA, poly-L-lactic acid, and calcium hydroxylapatite have been successfully used to fill the temporal fossa. These injections may help to improve the periorbital area by elevating the lateral brow. The lateral brow may also be injected with HA, in which case the needle should be inserted into the periosteal plane, taking care to avoid any vasculature. As with injections into the tear trough, one should be conservative with the volume injected.

Topical Products

Topical products to improve the appearance of this region now include prostaglandin analogues that not only increase the length and width of the eyelashes but also improve the length and girth of eyebrow hair. Use of bimatoprost daily resulted in an improvement of eyelashes in 78.1% of subjects after 16 weeks.²³ While this may not appear to be a major contributor to the aesthetics of the periorbital region, patient satisfaction with the improvement was significant. Bimatoprost has also been successfully used to improve the eyebrow hair.²⁴

Prescription and non-prescription products are a frequent adjunct to treatments in this location. Tretinoin has long been used to decrease periorbital rhytids and may also help decrease hyperpigmentation.²⁵ Cosmeceuticals containing retinol, growth factors, antioxidants, and a host of other ingredients have also been shown to help to improve fine lines and dyschromia of the periorbital region.²⁶

Complications

Complications can occur with each of these treatments. While most adverse events related to injection of botulinum toxins and fillers are related to injection trauma and include bruising, erythema, and swelling, some injections of botulinum toxins may result in ptosis or brow drop when the suspending musculature is relaxed.^{27,28} Injections of toxins into the lower lid may relax the muscle pumping action sufficiently to produce ballooning of the lower lid in a patient who has had prior eyelid surgery.²⁹

Fillers such as HA can have adverse events such as lumps and bumps, but can also have some serious and permanent complications including blindness, which can occur from vasculature occlusion.³⁰ Injections of fillers into the tear trough may produce significant periorbital edema, and the use of oral steroids may be helpful for minimizing this. Volumizers such as poly-L-lactic acid may cause subcutaneous papule formation, while calcium hydroxylapatite CAHA may result in bumps and white nodules when it is placed in the periorbital region.³¹ Lasers, intense pulsed lights, and radiofrequency devices may produce

burns, changes to pigment, and other complications that may scar the periorbital region. As mentioned previously, radiofrequency energy may result in transient nerve damage.³² Nerve damage that has been reported has been temporary and is believed to have resulted from the supraorbital nerve being trapped between the bony skull and the transducer. Chemical peeling agents used for the periorbital area have resulted in cicatricial ectropion, hyperpigmentation, hypopigmentation, and scarring. Topical agents such as bimatoprost and topical cosmeceuticals may cause irritation and hyperpigmentation.³³ Thus, treatment of the periorbital region is not without risk, and practitioners need to be aware of the potential for damage when they are treating this region.

CONCLUSION

The periorbital region is a critical cosmetic unit for human appearance. New technologies to tighten and resurface the skin, to grow the hair of the eyelashes and eyebrows, to smoothen and lighten the skin, and to replace volume lost from this area have created opportunities for rejuvenation that were not possible until recently. When treating this area, optimal outcomes may be attained by combining modalities and products and addressing each of the underlying issues. The psychological, aesthetic, and social impact of periorbital rejuvenation is only now being fully appreciated as treatments for this region have improved.

DISCLOSURES

Kenneth R Beer MD FAAD has served as a consultant, investigator, and speaker for Allergan Inc, Valeant, Kythera, and Anterios, and is a shareholder of Theraplex LLC. Stephanie Bayers BSBA and Jacob Beer have no conflicts of interest to disclose.

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