"IF I COULD TURN BACK TIME…"

Beauty practices that wreak havoc on the ocular surface: part three of a four-part series.

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Over the centuries, many have misquoted Shakespeare thus: "Vanity, thy name is woman." Shakespeare's Hamlet actually said, "Frailty, thy name is woman." The only weak female aspect is the ocular surface when it is aggressed with makeup, serums, and cosmetic enhancements. The misquoted vanity image, however, may be quite applicable in this day and age, when aesthetics is a growing industry for both women and men.[1]

Aging comes in two varieties: intrinsic aging, controlled by our genes, and extrinsic aging, influenced by our environment and lifestyle. The antiaging and facial rejuvenation sectors of dermatology and eye care are growing rapidly. According to statistics on plastic surgery procedures from the American Society of Plastic Surgeons, there were 15.9 million surgical and minimally invasive cosmetic procedures performed in the United States in 2015, a 2% increase over 2014.[2]

The same report[2] listed these procedure numbers for 2015 and percent changes from previous years:

- Botox (onabotulinumtoxinA; Allergan) injections: 6.7 million procedures, up 1% percent from 2014 and 759% since 2000;
- soft tissue fillers: 2.4 million procedures, up 6% from 2014;
- chemical peels: 1.3 million procedures, up 5 % from 2014;
- eyelid surgery: 204,000, down 38% since 2000;
- microdermabrasion: 800,000 procedures, down 9%.

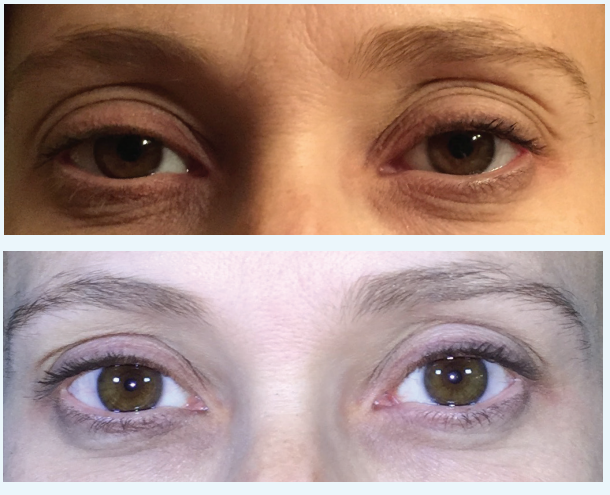
Extrinsic aging factors, including decades of sun exposure damage, poor nutrition, and lack of healthy activities, accelerate one's intrinsic aging processes. Because of their youthful reserves, young people do not immediately see the impacts from tanning, junk food, poor sleep and hygiene: The consequences come later. The people now entering this consequence phase are helping to drive the increasing popularity and acceptance of antiaging cosmetic products and procedures.

As aesthetic procedures have gained popularity over the recent decades, we have learned that what is good for the skin, our largest organ, is not always friendly to the eyelid. The eyelid is a specialized structure, and also the thinnest skin on the body.[3] Evaluation of and care for the eyelids are very important functions of eye care providers. The eyelid protects the ocular surface, which would otherwise be vulnerable as the only mucous membrane exposed during all waking hours to the environment.[4]

THE TERRIFYING TEENS

During the acne-prone teenage years, oil-gland targeting therapies are often used for acne control. These have a negative impact on the crucial, specialized meibomian oil glands of the eyelids. Ingredients causing ocular surface disease (OSD) include salicylic acid, benzoyl peroxide, tretinoin, acne face washes, and oral medications such as spironolactone and isotretinoin.[5] Note that the branded version of isotretinoin, Accutane, was withdrawn from the market in 2009 by its manufacturer, Roche Pharmaceuticals, after reports of side effects. However, generic versions remain available.

As seen with retinoic acid, what is good for the skin may not always be good for the eyes.[6] When considering more aggres-



Be skeptical of before and after pictures. Lighting changes give the appearance of improved skin tone and fewer under-eye wrinkles in the bottom photo. One easy way to compare enhancements with lighting is noting the pupil reflex, if a flash is used there will be a pinpoint of light centrally in the pupil.

THE PROBLEM WITH PIXELS AND PROOF

A picture may be worth a thousand words, but what is that picture actually saying? In the world of cosmetic marketing and advertising, "before" and "after" photos are commonly used to show the benefits of a product. However, the US Food and Drug Administration does not require clinical proof of over-the-counter cosmetics claims. That before-after photo comparison that impresses your patients at the cosmetics counter or online may simply be clever leveraging of photographic tricks that create or enhance the illusion of a product's effect.

Asa Mathat (asamathat.com), a world-renowned portrait photographer who has captured the essences of world luminaries such as the Dalai Lama, shared some insights into creating the best image possible (Figure).

1 POSTPRODUCTION WORK

A cosmetics company wants to promote the best possible effects, so postphotographic alterations with common programs such as PhotoShop are likely present in nearly every "after" photo. Pixel adjustments of the "before" photo could also be used to make the original look worse, thereby enhancing the delta between the before and after images.

2 REDUCED AND RELOCATED LIGHTING

Single-source overhead lighting highlights shadows and contours. This would accentuate the appearance of undereye bags. If the "after" image has diffuse, multiple light sources, the shadows are filled in, creating the illusion of greater effect.

3 OBSERVATION ANGLE

Look carefully at the position of the head and chin tilt. This trick can improve the appearance of nuchal skin laxity, an effect that some firming creams may claim.

4 OPTICS

A photographer may use a high millimeter lens in the "before" photo to magnify the subject's supposed defects. The "after" photo may then be taken with a lower millimeter lens for a wider field of view along with less detail, creating the illusion of improvement.

5 FOCUS AND FILTERS

Defocus and diffractive filters can fill in fine lines and create the illusion of softer skin with fewer wrinkles. Combined with diffuse lighting tricks before and after, the effects of a skin care product can be significantly enhanced. Subtle photography color gels can filter certain wavelengths and add to a glowing appearance. Pay close attention to the overall color, looking for cool or warm overtones that may have been leveraged to enhance the illusion of effect.

sive oral retinoic acid treatments, such as isotretinoin, there are many variables to weigh beyond its acne-treating effects. With use of isotretinoin comes many risks including cataracts,[6] meibomian gland atrophy and dysfunction,[7] increased osmolarity,[8] and symptoms of dry eye disease (DED).

Topical acne treatments may also be OSD-exacerbating agents, a consequence underappreciated and unknown by patients and eye care providers alike. In a recent study by Bayhan et al, after just 1 month of use, topical isotretinoin plus erythromycin was associated with a highly statistically significant increase in osmolarity and DED symptoms based on Ocular Surface Disease Index or OSDI scores.[9] More than half of patients using the compound were found to have punctate epitheliopathy, even though they were presumably applying products only to the acne-affected areas of the face and not within the orbital rim.[9] This rapid and significant negative impact on the ocular surface despite a lack of direct contact with the treatment is of concern. We must start incorporating patients' complete facial care routine and product use into our care for OSD patients.

Use of botulinum toxin by teenagers, or "teen toxing," is increasing around the globe. According to the American Society for Aesthetic Plastic Surgery, in 2009 botulinum toxin injections were the fifth most often performed cosmetic procedure for patients 18 years and younger. This raises several questions: Is this young generation of botulinum toxin users more appearance-conscious due to the rise of social media, or are they more prevention-aware and antiaging savvy? Do they

know that, when neurotoxins are injected to the crow's feet area, a DED-associated insult occurs?[10] Moreover, what are the potential impacts of additional OSD risk factors such as acne therapies and teen toxing for this generation of heavy users of smartphones and computers?

THE 20s: MILLENNIALS

As patients mature into their 20s, extrinsic aging factors are at the forefront, and lifestyle risks threaten the skin's youthful appearance. First jobs enable more buying power and routine aesthetic enhancements, while media and marketing campaigns further lure these youths into believing that aging prevention is key.

Establishing good habits during these years can improve the appearance of the skin for years to come. We should encourage our patients to think of their 20s as 'facial' boot camp.

A lifetime of decreased squinting from sun glare can be achieved through establishing the habit of regular sunglasses use. This decreases the repetitive squinting facial expression that can lead to unwelcome dynamic lines, especially to the skin overlying the orbicularis muscles (crow's feet) corrugator (frown lines) and glabellar ("eleven" lines between the brows) muscles.

During the 20s, we should encourage patients to eliminate bad habits such as tanning, smoking, excessive alcohol consumption, and ubiquitous all-nighters. Moreover, just as cigarette smoking has long been known to accelerate aging,[11] recent research also shows its negative impact on the ocular surface, with decreased Schirmer test scores and goblet cell density in smokers compared with nonsmoking control subjects.[12]

For many, daily cleansing routines are focused on twice-daily facial washes. Many of the available facial cleansers have harmful chemicals that can strip the natural oils from the face and around the eyelids.[13] It is important for patients to avoid ingredients such as drying alcohols and aggressive detergents and surfactants such as sodium lauryl sulfate in order to retain the skin's natural oils. Over time, simply applying and removing the facial cleanser gently and precisely, avoiding the delicate area inside the orbital rim, can help prevent overstripping. Clinically, a patient with significant meibomian gland dysfunction who is struggling with excess evaporative stresses (insufficient or poor quality meibum) may benefit from daily cleansing strategies that do not strip the oils that the overworked meibomian glands labor to create. A landmark paper demonstrated the meibomian gland upregulating effects of desiccating stress in a mouse model.[14] The meibocytes upregulated activity in response to the desiccating stress, however, the protein/lipid ratios suffered negatively suggesting altered meibocyte differentiation and meibum biosynethesis.

Our dermatology colleagues recommend annual exams for those over 25 years to assist in their fight against aging. How does this translate to eye care? Recommending annual ocular wellness exams is a great opportunity to grow your practice and your subspecialty in DED. These visits should include preventive medicine and lifestyle coaching with discussion about cosmetic use, application, and removal, as well as clinical evaluation of the ocular surface, lid margins, meibomian gland health, and tear film. Consider adding allergy testing to your clinic services (Doctors Allergy Formula; Bausch + Lomb) or reaching out to local dermatologists to collaboratively care for patients, as these specialists often have access to specialized allergy testing such as a cosmetic panel to help identify irritants for patients experiencing atopic dermatitis of the eyelids.[15]

THE 30s: THIRTY AND FLIRTY

Antiaging efforts require a definite routine. For patients in their 30s, higher salaries now permit them to visit the dermatologist regularly for assorted treatments including botulinum toxin injections, peels, and microdermabrasion. Their medicine cabinets are also becoming packed full with a collection of high-end serums, creams, and cosmetics to smooth the texture of skin and lighten dark spots caused by melasma and exacerbated by regular birth control pill consumption or years of neglecting sunscreen application.[16]

For women, altered hormone levels can start to cause a decrease in the water-storing properties of the epidermis. These skin changes are often seen first in the thin eyelids. There is a decline in cell turnover and collagen production during this decade, causing many to focus on techniques to hide the emerging dark circles and fine lines under their eyes. For others, fluctuating hormones combined with elevated stress levels can create the environment for adult-onset acne.

For many, the solution for dark circles is the use of a multitude of under-eye creams that promise a more youthful countenance. Some turn to minimally invasive procedures with soft-tissue fillers. These fillers vary in their type of material, duration of effect, and placement of injection (Table).

Juvéderm injectable gels (Allergan), a popular suite of facial fillers, are not ideal for use around the ocular adnexa due to their hydrophilic properties, which attract fluids and create more puffiness under the eye[17] as well as a discoloration termed the *Tyndall effect*. Other complications with fillers can include nodules and bruising or swelling of the injection site and eyelid.

Puffiness is another concern, often caused by dehydration, bloating, allergy, fatigue, genetics, or hormones. To shrink tissue, some turn to over-the-counter products such as Preparation H (Pfizer Consumer Healthcare), containing active ingredients such as phenylephrine, shark liver oil, and hydrocortisone. Using Preparation H under the eyes will reduce the size of veins and constrict blood flow to shrink swollen veins and quickly diminish puffiness, due to the effects of phenylephrine.[18] It is not ophthalmologically formulated. Additional concerns arise from chronic use of hydrocortisone, as it further thins the skin and causes redness and breaks in the capillaries.[19]

Solutions for fine lines can include retinols, hyaluronic acid, vitamin C, and microdermabrasion. Of particular concern is

TABLE. SOFT TISSUE FILLERS

Soft tissue fillers are often used for facial and orbital cosmetic procedures. Most of these fillers are absorbed by the body over time. Some of the injectables also contain lidocaine to lessen the injection pain and discomfort. This table outlines the materials used for dermal fillers as well as the duration of the filler in the tissue.

Absorbable Materials		
	Description of Filler	**Duration**
Collagen	A type of protien, typically for bovine or human cells	3-4 months
Hyaluronic Acid	A type of sugar (polysaccharide) often from rooster combs	6-12 months
Calcium hydroxylapatite	A type of mineral commonly found in teeh and bones.	18 months
Poly-L-lactic acid (PLLA)	A material found also in absorbable stitches.	Up to 2 years
Nonabsorbable Materials		
	Description of filler	**Duration**
Polymethylmethacrylate beads (PMMA microspheres)	A nonbiodegradable manmade polymer	Permanent

the use of retinols around the eye area given the hyperkeratotic effects and demonstrated meibomian gland cell culture toxicity.[7] Microdermabrasion makes one blink, as it uses a spray of aluminum oxide, magnesium oxide, sodium chloride or sodium bicarbonate crystals under pressure and vacuum, adjusted according to the patient's condition.

THE 40s: FORTY AND FABULOUS

Patients in their 40s are a dream demographic for cosmetic companies and dermatologists—not to mention eye care providers, who will see more of their 40-something patients due to Mother Nature's new vision tricks, such as the onset of presbyopia and the likelihood of newly developed symptoms of DED.

The focus of antiaging efforts remains on the continued thinning of the skin and eyelids, with increases in facial and eyelid margin redness, breaking of capillaries, and worsening of under-eye darkness. Several antiaging products and ingredients can have unwanted effects at this stage of life.

Among chemicals added to age-defying cosmetics, the retinoid family is particularly compromising to the ocular surface. When we review the products our patients with OSD are using around their eyes, we search carefully for retinoic acid and its cousins. Retinoic acid, in particular, damages meibocytes in cell culture[7] and theoretically contributes to MGD. Clinically, we observe that cessation of retinoid use around the eyes helps our MGD patients.

Neurotoxin injections are also associated with DED.[10] The most familiar of these are neuromuscular junction–blocking injectables such as Botox Cosmetic and Dysport (abobotulinumtoxinA; Ipsen Biopharmaceuticals and Galderma Laboratories) for decreasing dynamic aging lines. Our OSD patients who cease using these products in the crow's feet area report improved OSD symptoms.

Weakly neurotoxic topicals such as Argireline solution (acetyl hexapeptide-8; Lipotec) are touted as "Botox in a bottle" and marketed as "antiaging peptides." The wrinkle-reducing effects of these products may be detrimental to the orbicularis muscle and the blink forces necessary for a healthy ocular surface.

THE 50s: OVER THE HILL?

Individuals in their 50s are in the prime demographic for the onset of DED.[20] This is often the decade when patients try to reverse years of extrinsic aging with procedures such as intense pulsed light (IPL) therapy, radiofrequency skin tightening, and CO_2 laser skin resurfacing.

Some researchers have noted the improvement of rosacea-related OSD signs and symptoms with IPL therapy[21] and as an effective procedural treatment in MGD associated DED.[22] In addition to its well-known clinical effect of restoring a more youthful evenness to the skin tone, IPL has been found to have collagen- and hyaluronic acid–stimulating properties in human fibroblast culture.[22] IPL also coagulates *Demodex* mites,[23] which may contribute to its benefit for patients with facial or ocular rosacea.

Radiofrequency devices are nonablative and have rejuvenating biostimulatory effects. Even when performed at low energy and frequency levels, radiofrequency treatment is associated with increases in dermal-firming hyaluronic acid, tissue-remod-

eling matrix metalloproteinase 9, and rejuvenating collagen,[24] and a positive effect on OSD signs and symptoms.[25]

Fractional CO_2 laser resurfacing is more invasive and associated with longer recovery time, but it is an effective treatment for skin aging. These aesthetic laser modalities may be more expensive than other options, but they also seem to be less DED exacerbating than some topical antiaging products.[26]

THE 60s: DON'T GIVE UP THE FIGHT

After the turn of the half-century mark, patients may turn to blepharoplasty to recontour the eyelids, in order to eliminate excess skin and anteriorly displaced orbital fat. This is a traditional way to eliminate the puffy, tired, baggy look around the eyes. Upper blepharoplasty is performed through an incision in the crease of the upper eyelid. In lower blepharoplasty, the lower eyelid can be approached from an infra tarsal conjunctival incision. Often an incision is made in the orbital septum to allow the surgeon to remove excess orbital fat. Selective reductions are performed to recontour the eyelid. Clinically, we have seen overcorrections after blepharoplasty that leave an incomplete blink or eyelid seal, either of which can significantly exacerbate OSD. Other eyelid surgeries and their OSD complications are beyond the scope of this antiaging and OSD report.

Blepharoplasty is performed for both cosmetic and functional reasons. When eyelid dermatochalasis, blepharoptosis, or brow ptosis is clinically significant, loss of superior field of vision occurs. When this has progressed to a point at which functional visual field loss has occurred, often third-party insurance will cover the procedure. By contrast, cosmetic eyelid surgery, primarily intended to improve aesthetic appearance and not visual function, is arranged financially between patient and surgeon and is not covered nor governed by third parties.

Occasionally a blepharoplasty or lid laxity repair patient will have a sudden increase in OSD symptoms. Alterations of the lid wiper function, iatrogenic changes in lid closure from overcorrection (microlagophthalmos on light leak testing to frank lagophthalmos on gross examination), and even an aggressive wound healing response can push a previously compensated OSD patient into a significant increase in signs and symptoms. In a case series of 100 patients undergoing transcutaneous lower eyelid blepharoplasty, a 0.33 mm mean increase in distance between pupil and lower lid was noted, and 25% of patients reported experiencing new onset of dry eye symptoms.[27]

CONCLUSION

Some may say that Father Time is cruel. Others profess that aging is beautiful. Whether we support aesthetic procedures or not, it is best that we be aware of the trends and potential troubles the quest for beauty can inflict upon our patients. As always, education is key. The multibillion-dollar antiaging business is only going to grow, and wrinkles will continue to appear. Arm your practice with the correct knowledge and expertise about beauty practices and aesthetic procedures and the impact they have on your patients. Educating yourself about antiaging trends and products never looked so good. ■

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