# Cosmetics and the Eye: How Your Beauty Products Could Be Harming Your Eyes

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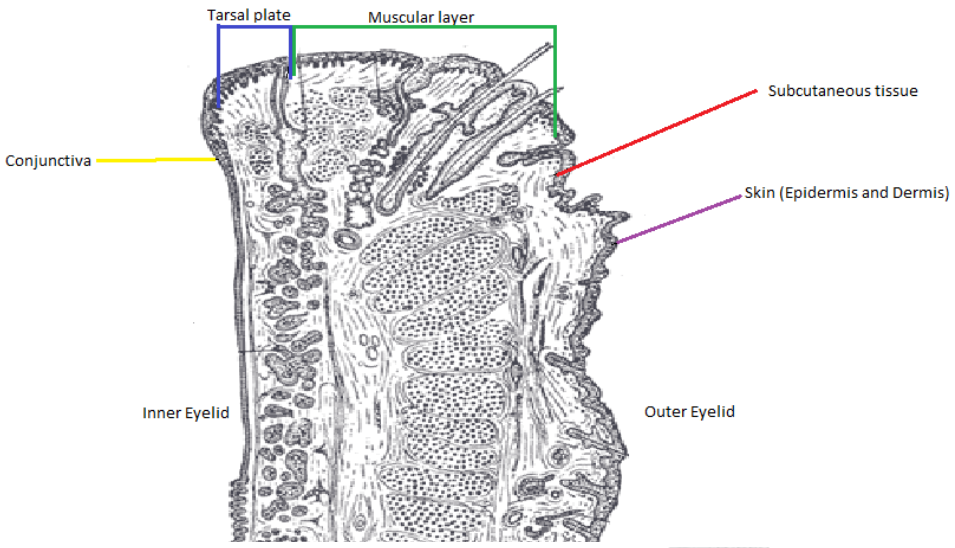
According to the United States Census Bureau, we spend ten billion dollars a year on cosmetics, beauty, supplies, and perfume. Eighty percent of women have used face and eye cosmetics in the last year and 75% of women use cosmetics to improve their confidence. With all this cosmetic use, over 50% of makeup users report not checking instructions on how long makeup should be left on, 90% of women use cosmetics beyond the expiration date, and 20% do not know that makeup expires at all. Optometrists are becoming the predominant primary eye care providers and see up to 75% of all primary eye care visits in the country. The optometrists and paraoptometrics must be aware of the products that our patients use, be knowledgeable of the effects they have on visual and ocular health, as well as offer insights on their proper use.

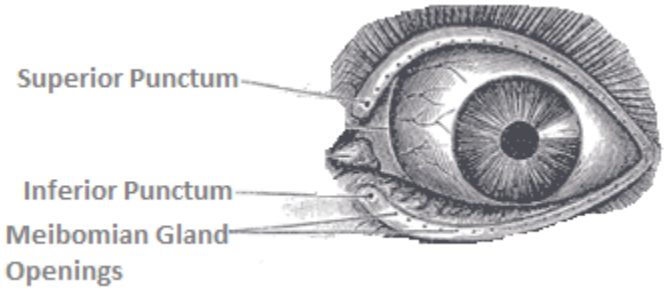
To understand how cosmetics affect the eye, it is first important to be familiar with ocular anatomy and physiology which is briefly reviewed below.

**Eyelids**

- The eyelids are made up of 5 different layers. When looking externally to internally, the layers of the eyelids consist of (1) skin (epidermis and dermis), (2) subcutaneous tissue, (3) muscular layer, (4) tarsal plate, and (5) conjunctiva. The superior and inferior eyelids have several key functions in ocular and visual function. The eyelids maintain proper position of the globe inside of the orbit, regulate the amount of light entering the eye via squinting, and protect the globe via the eyelashes and eyebrows, which physically help keep foreign objects from getting into the eye through reflexive and spontaneous blinking. The eyelids also play an integral part in maintaining the integrity of the cornea and tear film. They help produce one of the three parts of the tear film (the outermost oily layer), help spread the tears over the eye, and move the tears into the tear duct to drain out of the eye. As the eyelids close, they move superior temporally to inferior nasally which spreads the tears evenly over the whole eye. As the eyelids close and

meet, they push the tears into the puncta (opening of the tear ducts), at the superior and inferior nasal aspects of the lids.




**Cilia / Eyelashes**

There are 2-3 rows of lashes (cilia) on each eyelid with the upper eyelid holding 100-150 and the lower eyelid holding 50-80 cilia. Cilia are housed in the muscular layer of the eyelids and have a lifetime of 3-5 months. Eyelashes help keep foreign objects from getting into the eye via reflexive and spontaneous blinking. Each lash is associated with a gland of Zeis (a sebaceous / oil gland) and a gland of Moll (a sweat gland). These glands secrete oil and sebum at the lash follicle which coat the base of the lashes and are involved in local immune defense.

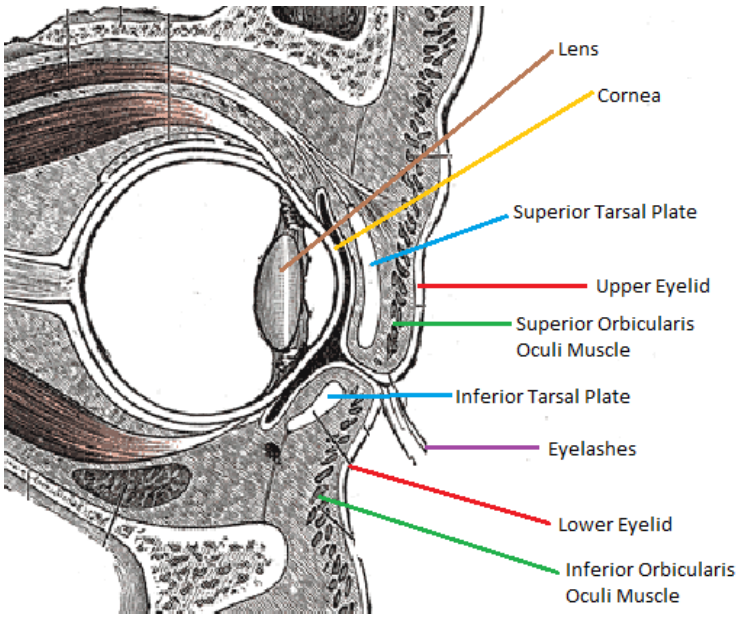
**Meibomian Glands**

The meibomian glands produce the outermost oily layer of the tear film. They are imbedded inside the tarsal plate of the eyelids with the orifices opening just inside the eyelash line. There are 20-40 meibomian glands in the upper eyelid and 15-25 in the lower eyelid.

**Cornea**

The cornea is the clear, protective, dome shaped outermost layer of the eyeball which plays an important role as a barrier against outside particles and in focusing the light entering the eye

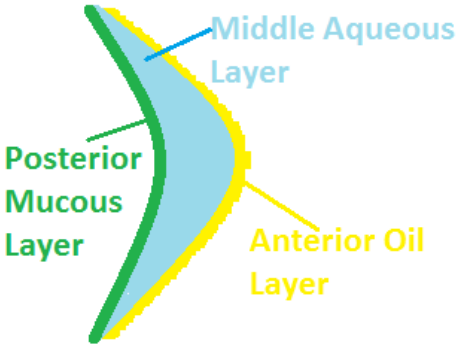
onto the retina. The outermost layer of the cornea, the epithelium, in conjunction with the conjunctiva, produces the innermost mucous layer of the tear film.




**Conjunctiva**

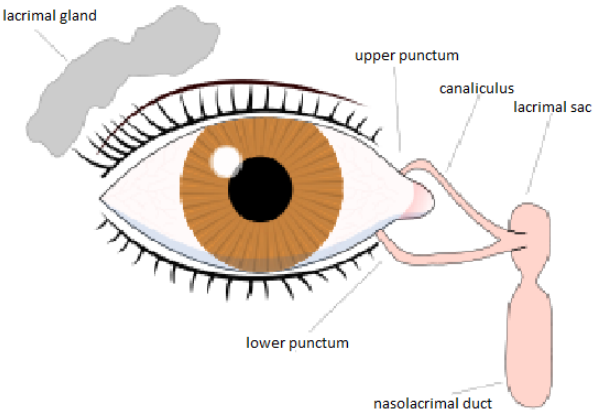
The conjunctiva is a transparent, highly vascularized tissue that lines the inside of the eyelids (palpebral conjunctiva) and covers the white sclera (bulbar conjunctiva). The conjunctiva contributes to the immune protection, oxygen supply, as well as lubrication of the eyes. The goblet cells in the bulbar conjunctiva, along with the corneal epithelium, produce the innermost mucous layer of the tear film.

**Tear Film**




The tear film coats the cornea and conjunctiva and is composed of three layers: (1) oil layer produced by the meibomian glands in the eyelids, (2) aqueous water layer produced by the lacrimal gland, and (3) mucous layer produced by the bulbar conjunctiva and epithelial layer of the cornea. The oil layer prevents the tear film from evaporating as well as forms a hydrophobic barrier at the eyelid margin so the tears do not spill over the eyelid margin. The aqueous layer provides oxygen and nutrients to the cornea and conjunctiva and has some antibacterial properties. The inner mucous layer allows the tears to spread evenly over the cornea and conjunctiva.

**Nasolacrimal Duct**




The tear film and any debris sitting on the ocular surface are removed from the eye and into the nose via drainage through the nasolacrimal duct. As the eyes blink, they wipe and push the tears into the two small openings in the nasal upper and lower eyelids called the puncta. Each punctum leads into a small tube called the canaliculus which then drains into the lacrimal sac in the inside corner of the eyes along the upper part of the nose. The lacrimal sac then drains the tears into the nasolacrimal duct canal which empties the tears into the nasal cavity.

## HOW MAKEUP NEGATIVELY AFFECTS OCULAR HEALTH

**Dry Eye Disease**

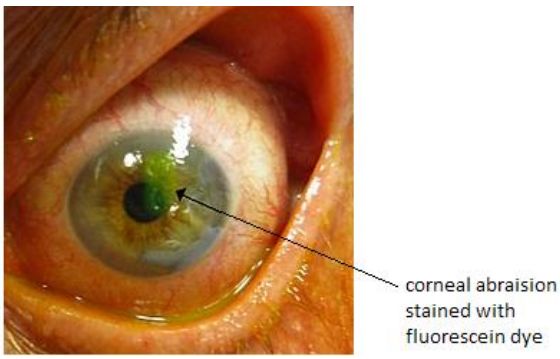
Over 33 million people suffer from dry eye disease (DED) in the U.S and over $500 million is spent on dry eye symptom relief annually in the U.S. alone. It is one of the most frequently encountered ocular diseases seen by eye care providers and one of the greatest unmet treatments needed for our patients. If left untreated, the damage from this chronic and progressive disease can range from simple nuisance and contact lens wear intolerance to possible corneal damage and vision loss. Patients with dry eye may complain of a dry and gritty feeling to the eyes, heavy eyelids, intermittent blurry vision, tearing, stinging, burning, redness, and discomfort with activities requiring sustained visual attention or focusing, especially on the computer and other electronics. A structural dysfunction in the tear film will lead to a chronic and progressive loss of the tear's ability to function properly. The vast majority of patients that present with DED do not have an absence of tears but an unstable and improperly functioning tear film. Cosmetics can either cause or exacerbate an already existing dry eye by:

A. Clogging the meibomian gland openings and not allowing the oily layer of the tear film to be properly excreted into the tears. The oily layer prevents premature evaporation of the tears into the air. This occurs more frequently with chronic use of heavy makeup.

B. Improper makeup application, and failure to remove makeup before bed. If there is a thinning and disruption in the oil layer of the tears, they will evaporate quicker, leading to ocular dryness. Chronic clogging of the meibomian gland orifices can lead to meibomian gland dysfunction and atrophy resulting in irreparable loss of the gland.
C. Makeup debris and particles can get into the tear film and onto the cornea and conjunctiva. The particles themselves can be an irritant but also disrupt the tear film leading to a faster tear breakup and evaporation time and exposure of the corneal surface to the air. Certain makeup, such as eyeliner, can also change the viscosity of the meibum, which will adversely affect tear stability. Cosmetic remover applied to closed eyes may still migrate inside the eye and worsen dry eye by decreasing tear film stability, thinning the tear film, and increasing evaporation.
D. Makeup debris and makeup remover can also coat the conjunctiva leading to dysfunction of the goblet cells which help produce the mucin layer of the tear film.
E. Makeup debris and remover that enter the eye will bind to the surface of contact lenses, leading to a decline in the comfort and tolerance of contact lens wear.

**Risk of Mechanical Trauma**

A. One of the most common eye injuries is a patient poking the eye with a mascara wand. Thirty percent of mascara has microbes present inside the container after three months of use by a single user and this increases if two or more people use the same wand. Aside from the physical trauma, corneal or conjunctival trauma from a mascara wand gives these microbes immediate entry into the ocular surface and can result in a serious infection of the eye.



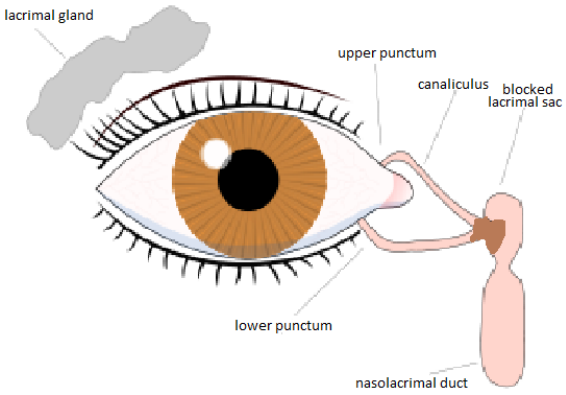

B. Glue from false eyelashes can enter the tear film or ocular surface which may lead to disruption of the tear film, corneal and conjunctival abrasions, and bacterial infections.

**Allergy and Toxicity**

a. Cadmium, a heavy metal often used in eyeliner, used heavily and chronically can cause damage to the corneal endothelium cells resulting in corneal swelling and potential permanent scarring in the worst cases.
b. Top allergens found in cosmetics include: preservatives, antioxidants, resins, pearlescent additives, fragrances, nickel, surfactants (in waterproof makeup remover). If the patient is allergic to a component of the cosmetic they may exhibit:
    a. Dermatitis or an allergic reaction (band of a rash, redness, inflammation, and/or dry flaky skin) along the eyelash line from eyelash cosmetics.
    b. Dermatitis along the whole eyelid from eyelid cosmetics.

**Skin and Conjunctival Pigment Change**

Punctate deposits of pigment can embed on the skin or in the palpebral conjunctiva (the conjunctiva that lines the inside of the upper and lower eyelids) with heavy and chronic use.




**Blockage of the Nasolacrimal Drainage System**

Heavy and chronic use of certain makeup, such as mascara, can lead to an accumulation and obstruction of the lacrimal drainage system, most commonly in the lacrimal sac or nasolacrimal duct. This can lead to perfuse tearing in that eye as well as inflammation and infection in the area.

## PROPER MAKEUP APPLICATION AND REMOVAL

Proper eye makeup use can significantly decrease the risk of complications or adverse reactions and should be discussed with all patients wearing eye cosmetics.

**Application**

A. Be sure to apply any makeup, including eyeliner and eyeshadow, outside the eyelash line to help avoid blocking the meibomian glands and prevent introduction of bacterial directly into the eye.
B. Apply mascara to the tips of the lashes instead of starting at the roots and preferably to the top lashes only.

**Removal**

A. Makeup must be removed before bed to avoid clogging the meibomian glands and preventing infection. Instruct the patient to remove contact lenses before removing the makeup. The makeup removal solution will adhere to the contact lenses if any small amount gets into the tear film and cause contact lense wear discomfort.
B. It is best to use gel based makeup removal products that are oil and paraben free and avoid irritants such as mineral oil, sodium lauryl sulfate, and diazolidinyl urea.
**C.** Using a gentle eyelid scrub after the makeup is removed can help remove excess makeup and the makeup removal solution as well as help unclog the meibomian glands.

**Hygiene**

A. Wash hands with soap before applying or removing makeup.
B. Keep makeup applicators clean by washing all brushes properly and using a brush cover when not in use. Replace brushes at least every 6-12 months and if used during an eye infection.
C. Avoid sharing makeup when possible. If you have to, make sure you use a new applicator when trying samples at a store or if sharing makeup.
D. Sharpen your makeup pencil before use to remove the top layer of bacteria.
E. Do not pump the mascara brush in and out of the container since it introduces air and bacteria into the bottle.
F. Do not use the same pencil on different parts of the eyes and face since every part of your face has its own normal group of bacteria which may cause an infection if introduced to another part of the face or eyes.
G. Do not use saliva to assist in makeup application.

H. All makeup has an expiration time from when it is opened. It can be found on the back label marked in months (6M = 6 month after opening). Keep a marker in the makeup kit to note the date a product was opened. In general, makeup should be disposed of every 3-6 months.
I. Discard makeup which has been left uncovered without a lid.

Do not use any eye makeup during an eye infection to avoid contamination of the cosmetic. If it was used accidentally or unknowingly, throw it away to prevent re-contamination and re-infection of the eyes.

**Makeup type**

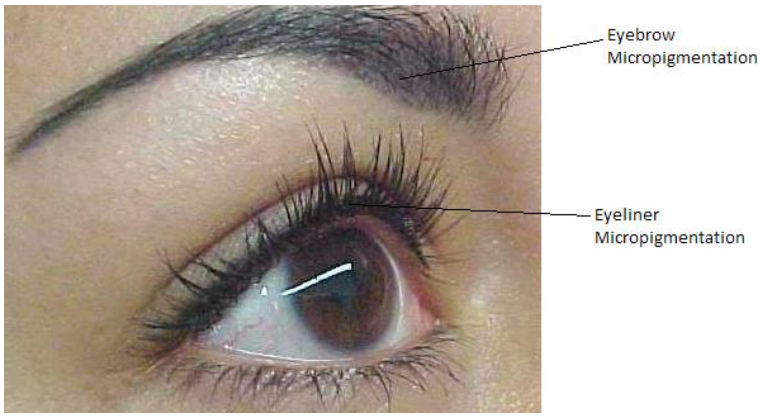
A. Glitter and powder-based shadows and foundations have tiny particles in them that can get into and aggravate the eyes and cause infection. Cream shadows, highlighters, and foundations are less likely to have this problem.
B. To avoid allergies or irritation, avoid ingredients such as arsenic, beryllium, cadmium, carmine, lead, nickel, selenium, and thallium. Hypoallergenic brands usually have a lower likelihood of containing these irritants.
C. Makeup with a higher water content, such as liquid makeup, is more prone to bacteria and fungus buildup. To avoid this potential contamination, these cosmetics require a preservative to be added in by the manufacturer which can be a standalone irritant for the eyes.
D. The two-step mascaras consisting of a nylon base coat and a colored top coat tend to flake, fall into, and accumulate into the tear film causing irritation and discomfort.
E. If eye makeup is causing an issue, the patient can find alternatives such as using an eyelash curler or concentrating the makeup to the eyebrows, cheeks and lips.

## MICROPIGMENTATION (PERMANENT MAKEUP)

Micropigmentation, also known as semi-permanent makeup or cosmetic tattooing, is becoming a more frequent mode of cosmetics. It was used in the early 1980s as a medical restoration to address the appearance of patient with conditions such as alopecia, burn victims, cancer survivors, and vitiligo. It also has a use in patients with motility problems such as arthritis and

Parkinson's disease, which make cosmetic instillation difficult or impossible for the patient. It's growing popularity in the general population stems from the benefits of cost, time, consistency of appearance, and convenience. The most popular cosmetic enhancements include eyeliner, eyebrow, lips, blush, and eyeshadow.

The common procedure for micropigmentation involves instilling a topical or injected anesthetic and using a vibrating needle to deposit pigment granules into the epidermis beneath the upper layer of skin. Each time the needle penetrates the skin, a droplet of pigment is released into the hole made by the needle. It takes 3-4 weeks for the color to fade into its permanent shade. The patient will follow up after 4-8 weeks to assess healing and need for any touch up. It is a misconception that cosmetic tattooing is permanent, the pigment only lasts several years and will then fade. This procedure is not covered by insurance and usually costs a couple to several hundred dollars depending on the provider and work being done. Eyeliner for both upper and lower eyelids of both eyes takes about one hour to perform.




Micropigmentation can be performed by an electrologist, cosmetologist, aesthetician, tattoo artist, nurse, or doctor. Regulations for practitioners vary by state and some states have no regulation at all. The average cosmetologist requires 1,200-1,500 hours of training to be certified to cut hair. While it is recommended that a provider performing micropigmentation receives 600-1,500 hours of training, it is possible for someone to buy a machine and pigment online and start performing micropigmentation without any training or regulation at all.

The inks used in micropigmentation are subject to *scrutiny* by the Food and Drug Administration (FDA) but are not regulated by them. Any micropigmentation label stating "FDA-

approved colors" is a misrepresentation and false advertising since no color additive has ever been FDA approved for injecting under the skin. The pigment may be FDA approved but may have been approved for topical cosmetics, food, or wall paint, not micropigmentation. Since the pigments are not sold to consumers, the ingredients are not required to be labeled and some pigments are a mixture of materials. The tattooist may not even fully know what is in the dye being used.

As this procedure is becoming more popular, there are some major risks to micropigmentation that the patient must be aware of before moving forward. If there is an adverse reaction from micropigmentation, it should be reported to the Cosmetics Adverse Reaction Monitoring (CARM) program run by the FDA.

A. Risk of infection - the main potential pathogens for infection include Pseudomonas aeruginosa, Staphylococcus aureus, and Candida albicans. There is a possibility of the product being contaminated during manufacturing but more commonly contamination comes from general produce use and use with multiple patients. The bacteria present is generally proportional to the expiration date (as the effectiveness of preservatives decreases with time), when the product was opened, and the amount of previous use. The risk of infection increases if the provider is using non- sterile procedures such as using non sterile tap water to dip needles into or reusing ink and needles.
A. Aside from potential blisters and scars in the treatment area, patients may also develop:
    a. Granulomas - bumps and elevations occurring under the skin when the body encapsulates foreign substances in the skin (the ink).
    b. Keloids - bumps and elevations that occur due to an overgrowth of scar tissue. This occurs more commonly in patients that choose to have removal of a previously performed micropigmentation.
B. If a dye containing iron oxide is used, the patient may experience a burning sensation in the treatment area during Magnetic Resonance Imaging (MRI).
C. If the patient is allergic to the dye (or something in the dye) this can be devastating as the irritant cannot be removed. Allergies can occur within hours, days, weeks, or years later. Iron oxide is least likely while vegetable, organic, or herb based dyes are more likely to produce an allergic reaction.

D. Pigment migration occurs over time and can be minimal or very cosmetically significant, making small distinct lines look like large colorful smudges. Migration of the pigment depends of the patient's age and skin type and occurs more with India ink and less with iron oxide based dyes.

If a patient is interested in micropigmentation they should take as much precaution to avoid adverse side effects as possible. Our patients should be made aware that while it is possible to remove micropigmentation via procedures such as laser treatment, dermabrasion, surgical removal or tattooing over the area to camouflage what is there, the removal is likely to leave a scar.

A. Ensure that the office has a business license, a board of health inspection certificate, as well as an occupational safety and health administration (OSHA) bloodborne pathogens class certification.
B. The provider should have an American Academy of Micropigmentation (AAM) certification. The AAM certification consists of a written, oral, and practical examination to signify that the provider is versed in the procedure being performed.
C. Ask to meet one or two of the practitioner's clients to see their work for yourself, as pictures and testimonials can be faked. You can ask to sit in the waiting room and look at the patients as they walk in and out of treatment.
D. Ask the provider how long they have been practicing and how many procedures (that you are specifically requesting) they have performed. Keep in mind that a doctor is not always the best practitioner, the patient may be better off with a cosmetologist or nurse under the supervision of a physician as they generally have more experience with the technique.
E. Be as precise as possible about what you want, bring in an exact picture, come in wearing the makeup exactly as you would like it tattooed, and have the provider use a sterile surgical pen to sketch the area to be tattooed so that you are sure they understand what you want.
F. Watch them open and remove a needle from new, sterile packaging and watch them open a fresh bottle of pigment.
G. Perform a small patch test first in an area no readily visible to make sure you are not allergic to the pigment being used.

H. Follow all care instructions given. Depending on the area being treated, instructions may include asking the patient to avoid direct sunlight, avoid make-up in the treated area, and apply petroleum jelly to the area for a week. They may also ask that the patient avoid contact lenses for a few days, avoid swimming pools and hot tubs for several weeks, and to not pick at peeling or flaking skin.

It is our responsibility, as the primary eyecare providers to patients, to be informed and to educate them about behaviors that may adversely affect their ocular and visual health and comfort. We should be discussing proper makeup type, application, and removal procedures, especially in patients who already exhibit ocular surface and dry eye disease signs and symptoms. We must be aware of these products, their effect on the eyes, and be able to offer insights to our patients.

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