Contact Lenses: Technology, Terminology, and Tomorrow

(Home Study Course HS-24)

by
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Course Objectives

Upon completing this one-hour home study module, participants should:

- Understand the legal limitations Florida opticians have in terms of diagnosis and treatment.
- Be more prepared and confident to discuss ocular conditions and more effectively refer patients to optometrists, ophthalmologists, and emergency rooms.
- Know about common refractive errors corrected with contact lenses.
- Have a deeper understanding of the scientific terms contact lens companies use to describe their products and technology and be more ready to explain them to patients.
- Be more aware of what's coming in the future (the tomorrow) of contact lens technology.
- Obtain a minimum score of 70% on the 20-question final assessment.

I Introduction

In Florida Statute 484, part 1 it clearly states that it is beyond the scope of an optician's practice to diagnose ailments of the human eye, to prescribe, or to even determine the refractive power of the eye. However, the very first sentence of that same statute clearly and firmly states that the only reason we are even licensed in the first place is to protect the safety, health, and welfare of the people of Florida. And truly, of all the Eye Care Professionals (ECPs)…of all the Big Three Os – Ophthalmologists, Optometrists, and Opticians – which one patrols the front lines? Which one mostly performs the task of triage? Who engages them first and spends the most time with patients? Of course: opticians.

Be that as it may, this course is not designed to encourage you to exceed the scope of your practice. Rather, it is designed to make you more knowledgeable and more confident when simply having discussions with patients so that you might be more comfortable and confident to answer a question with something like, "Well, that one is certainly beyond my grade (after all, I am not a doctor), but if I were you, I might worry that I have_____, and I would get my butt to an ophthalmologist sooner rather than later, You know…like maybe today!"

Likewise, imagine the following conversation between a patient and an eye-care "professional":

Patient:	"I'm here to pick up my contacts. Last name is Johnson."
Optician:	"First name Alex? You live on Elm Avenue?"
Patient:	"That's me."
Optician:	"Here you go. (Hands four boxes of contacts to the patient).
Patient:	"These don't look right. They say they have something called HydraGlyde in them; they've never said that before."
Optician:	"Oh…they probably changed the packaging or something. According to this, it's what your doctor prescribed."
Patient:	"Oh…okay."

Now imagine that the last thing the optician said to the patient was not some tentative, on-the-spot, made-up answer, but instead, without hesitation the eye-care **professional** had replied: "Not to worry. HydraGlyde is a technology that Alcon added to its Air Optix contacts a few years ago. They improved their moisture matrix (which is like a wetting agent), and now it keeps the lens hydrated longer – so it's more comfortable for you to wear." Wow! What a difference.

The next section is jam-packed with the Terminology and the Technology aspect of the course. (or maybe it is more accurate to say it is jam-packed with the Terminology OF the Technology of contact lenses.) Either way, do not be put-off by the glossary like layout of Section II. Rather, take it all in. Make some notes in the margins. Pay extra close attention to those terms that you see contact lens manufacturers touting on their labels and shouting in their advertisements. You know, the ones you have no idea what they are or what they mean (and frankly, I had no idea what some of them were until I did the research for this module). Because I have news for you: If we don't know what they mean, most of our patients have no idea either.

Commented [AR1]: did you know any? If so, say something like:

(and frankly, I had no idea about what a few of them were myself until I did the research for this module)

II Terminology and Technology

Acanthamoeba: A microscopic organism commonly found in soil, freshwater as well as chlorinated pools and hot tubs. This amoeba can cause serious infections of the eye, skin, and central nervous system. It can be introduced into the cornea via a contact lens, and cause acanthamoeba keratits, a potentially blinding infection.

Commented [AR2]: soil and freshwater, as well as chlorinated pools and hot tubs.

Acanthamoeba Keratitis: A rare disease (usually affecting about 100 people annually in the United States, and about 1 in 10,000 contact lens wearers) in which amoebae attack the cornea. If untreated it may cause permanent damage, up to and including blindness. Signs of acanthamoeba keratitis include foreign-body sensation, redness, pain, blurred vision, photophobia, and excessive tearing. If an optician even suspects a patient may be experiencing this phenomenon, he or she should advise an immediate trip to the eye doctor or emergency room.

Accommodation: The focusing within the eye which increases the total optical power to maintain a clear image as an object is moved closer to the eye (like when reading, for example). This is accomplished by the natural lens of the eye changing its shape (contracting to focus up close and then relaxing to focus on more distant objects). A combination of the ciliary muscles contracting and the zonular muscles relaxing facilitates this change in the shape of the lens.

Alcon. Alcon is an American and Swiss medical company which specializes in eye care products with headquarters in Geneva, Switzerland. Alcon began as a US company and its US subsidiary's headquarters remain in Fort Worth, Texas, where the Alcon division of the company was founded in 1945. In 2021, Alcon generated $8.3 billion in revenue. Alcon produces soft contact lenses that correct myopia, hyperopia, astigmatism, and presbyopia. As of this writing (November 2022). Alcon offers 14 different lens options that are replaced either daily or monthly. Alcon's lenses include Dailies Total30, Dailies Total1, Precision1, Dailies AquaComfort Plus, and Air Optix. Here is some of the terminology unique to Alcon:

- **AquaComfort Technology** (Blink-Activated Moisture in Dailies AquaComfortPlus, Dailies AquaComfort Plus Toric, and Dailies AquaComfort Plus Multifocals). Alcon designed "blink-activated moisture" so that it releases polyvinyl alcohol (PVA), which is a water soluble, synthetic polymer. Different types of PVA are floating within the lens matrix. When the patient blinks, it triggers the lens to release cross-linked PVA, which in turn supports tear film stability while continuously hydrating the contact lens surface. This substance has been used as an eye lubricant for many years.

- **Celligent Technology** is a term that Alcon uses for a gel-like substance that is found on the surface of Total30 that helps the water-gradient stay active for up to 30 days. It is meant to act like the glycocalyx (a gel-like layer covering the luminal surface of vascular endothelial cells) of the ocular surface, which Alcon says increases hydration and decreases friction.

- **HydraGlyde Moisture Matrix** is a lens feature found in Air Optix Plus HydraGlyde, Air Optix Plus HydraGlyde for Multifocals, and Air Optix Plus HydraGlyde for Astigmatism that aids in long-lasting lens hydration. It is a polymer that embeds itself on and within the lens surface and works to attract and retain moisture. This in turn creates a hydrophilic barrier between the lens and the eye, which increases comfort by reducing friction. The HydraGlyde Moisture Matrix is also an ingredient in Alcon's OptiFree PureMoist Multipurpose Disinfecting Solution.

- **Precision Profile Design is** utilized in Alcon's Dailies Total1 Multifocals and Air Optix Aqua Multifocals and is meant to maximize comfort for presbyopic patients. The technology utilizes three features that aim toward making more seamless transitions from distance to intermediate to near vision. The three features are: a bi-aspheric surface, an adaptive minus power profile, and a center-near design. The bi-aspheric design creates irregular curvature on the front and back surface of the lens, which make the lens thinner and lighter. The adaptive minus power profile minimizes aberrations by creating a smoother progression of power gradients from center-near to intermediate and distance zones. The center-near design mimics the natural dilation and constriction of the pupil to help optimize visual range.

- **SmartShield and SmartSurface Technology.** Alcon features these technologies in all their monthly lenses and in all Precision1 daily replacement lenses in order to form a permanent, protective shield around the outer lens surface to help protect it from lipid deposits.

- **Water-Gradient Technology** debuted in 2015 and is found in Alcon's Dailies Total1 and Dailies Total 30 lenses. The lens core is 33% water (which helps to ensure high oxygen permeability,) and the water content gradually increases to nearly 100% at the lens surface to aid in moisture retention and increased comfort.

Astigmatism: The most common refractive error in the world (nearly everyone has some degree of astigmatism), it is a condition of the eye in which the curvature of the cornea focuses light rays at two different spots within the eye. This can create eyestrain and, in some cases, blurry vision. Astigmatism can be corrected with special toric contact lenses or eyeglasses, as well as with laser vision correction.

Avascular: Lack of blood vessels or blood supply. While it has thousands of densely packed nerve endings, a normal human cornea is avascular.

Bandage Contact Lens: A soft contact lens that is used to cover and protect the epithelium of the cornea so that it can regenerate following a trauma, such as a corneal abrasion or PRK refractive surgery.

Bausch + Lomb (B+L) was founded in Rochester, New York in 1853. It is one of the world's largest suppliers of contact lenses, lens-care products, pharmaceuticals, intraocular lenses, and other eye surgery products. It launched its aptly named Soflens just over 50 years ago. It was the first commercially successful soft contact lens. B+L manufactures spherical, toric, and multifocal soft lenses. It is also one of only two major contact lens companies (the other being CooperVision) to sell toric, multifocal lenses (B+L Ultra Multifocal for Astigmatism). Lenses are available as daily or monthly replacements and as of this writing (November 2022), B+L has nine lens options available. B+L markets its lenses under many different "sub brands" including BioTrue Oneday, Infuse, Soflens, PureVision, and Ultra. B+L uses three unique terms to describe its lenses: Dual Elliptical Stabilization, MoistureSeal Technology, and ProBalance Technology.

- **Dual Elliptical Stabilization** describes a process for ballasting toric lenses meant to assist with lens orientation and rotational stability. Extra lens material is added at the three o'clock and nine o'clock positions to add weight and help maintain the proper position and lens axis as the patient blinks.

- **MoistureSeal Technology** is found in B&:'s toric and astigmatic lenses. This technology is designed to lock in moisture for up to 16 hours. "MoistureSeal" is a two-phase polymerization process that increases oxygen permeability and moisture retention.

- **ProBalance Technology** is only used in Infuse Daily contact lenses. "ProBalance technology" uses a combination of ingredients including ocular moisturizers that are infused into the lens and work to help maintain ocular lens homeostasis (a stable equilibrium among interdependent elements of a solution) and reduce contact lens dryness. The formula is made up of glycerin and erythritol to help combat hyperosmotic (high-pressure) stress; potassium, an electrolyte to promote ocular homeostasis; and polaxamine 1107 and polaxamer 181 – moisturizers that help the lens retain hydration and maintain tear proteins.

Bifocal Contact Lens: A soft contact lens that incorporates correction for both distance and near vision in the same lens.

Blepharitis. Blepharitis is another one of those conditions easily recognizable by an optician. It is simply an inflammation of the eyelid, most commonly occurring near the lid margins. It is usually caused by a disorder in the Meibomian glands of the eyelid, related to the oil that it secretes, scalp dandruff, bacteria, or some combination of the three.

Board-Certified Optician: In Florida, a licensed optician certified by the Board to be qualified to independently fill, fit, adapt or dispense soft contact lenses pursuant to FS484, part1, and subsection 64B12-10.009(2), F.A.C

Buffer: Keeps pH of a CL solution as close to the pH of natural tears as possible. A buffer also aids in the efficacy of cleaning and disinfecting agents. Common chemical buffers used include phosphates, borates, and citrates. These buffers help to control chemical reactions and reduce product degradation.

Chelator: In contact lens solutions, a chelator prevents calcium-bound proteins from depositing on the lens surface, which aids in disinfection efficacy. A common chelator is EDTA (ethylenediaminetetraacetic acid), which chemically binds proteins and metals, may prevent lens deposits, and acts as a microbial preservative.

Concave Contact Lens: A lens that is thicker at the edges than in the center, which causes light rays from an object to diverge. This causes light rays in a myopic eye to focus on the retina, which brings a blurry image into focus. Nearsighted eyes focus their light rays in front of the retina.

Conjunctiva: The transparent mucous membrane that covers the outer surface of the eyeball (sclera) but not the cornea. It also lines the inner surface of the eyelids.

Conjunctivitis. Conjunctivitis, as its name implies, is the inflammation of the conjunctiva. It is also commonly referred to as "pink eye." Conjunctivitis may be caused by a virus; bacteria; allergic reaction to things like smoke, dust, dirt, or pollen; or in the case of giant papillary conjunctivitis (GPC), a reaction to a foreign body, (most commonly a contact lens). The first signs of conjunctivitis are, most obviously, a pink eye, along with hurting or itching eyes. As with many things, avoidance is the best "cure," but frequent hand washing, good hygiene, and not sharing things like towels, cosmetics, and contact lenses should prevent its spread. Once infected, depending on its cause, a doctor may or may not prescribe medication. With viral pink eye, nothing will probably be prescribed, as the problem should go away on its own in a few days. If the problem is bacterial in nature, antibiotic drops will probably be indicated. For GPC, additional medications will probably be used to reduce the swelling and inflammation.

Contact Lens (CL): A small disc made of various silicone and/or plastic materials usually containing an optical correction which is worn over the cornea as an alternative to spectacles, which can correct nearsightedness (myopia), farsightedness (hyperopia), astigmatism, and presbyopia.

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Contact Lens Cleaner/Surfactant: Removes dirt, some mucin (protein molecules), debris, make-up, etc. from contact lenses.

Contact Lens Technician: An ophthalmic technician who performs the diagnostic measurements, under the supervision of an ophthalmologist, which help determine the contact lens parameters necessary for each individual patient. In Florida, the only people who may fit and prescribe soft contact lenses are medical doctors (usually ophthalmologists), doctors of osteopathy, optometrists, or Board-Certified opticians.

Convex Contact Lens: A contact lens that is thicker in the center than at the edges, which causes light rays from an object to converge. This causes light rays in a hyperopic (farsighted) eye to focus on the retina, which brings a blurry image into focus. Farsighted eyes usually focus their light rays behind the retina.

CooperVision is a subsidiary of The Cooper Companies, whose headquarters is in Pleasanton, California. Founded in 1958, Co and MISight (which are the myopia-control lenses). CooperVision was most recently celebrated for having the only FDA-approved soft contact lens for myopia control in the United States. As of this writing (November 2022), it offers 14 soft lens varieties, including single vision, toric, multifocal, and multifocal toric. Replacement schedules are daily, bi-weekly, and monthly. Their lens sub-brands include MyDay, Clariti, Biofinity, and Avaira Vitality. CooperVision has at least nine proprietary terms it uses, including Aberration Neutralizing System, ActivControl Technology, Aquaform Technology, Balanced Progressive Technology, Binocular Progressive System, Digital Zone Optics, Optimized Toric Lens Geometry, PC Technology, and WetLoc Technology.

- **Aberration Neutralizing System** is used in the MyDay daily disposable lenses, Biofinity, Biomedics 55 premier, and Avaira Vitality lenses. This feature seeks to reduce annoying spherical aberrations which can lower the quality of vision in some single vision contact lens wearers. It is incorporated into all of CooperVision's spherical lenses and is meant to help patients see better in darkness and in bright light. It works by converging light rays as they hit the lens to produce a single point of focus that can help sharpen vision.

- **ActivControl Technology** is the technology that CooperVision credits the MiSight lenses slowing the spread of myopia. It features a dual-focus concentric ring multifocal

design that combines several alternating distance correction zones.

- **Aquaform Technology** is found in MyDay and Biofinity lenses. The main purpose of Aquaform Technology is to offer greater oxygen permeability. This is a good feature for contact lens wearers who do not blink as often as they should (and in the age of digital devices that's almost *all* contact lens wearers).

- **Balanced Progressive Technology** is featured in most of CooperVision's multifocal contacts and gives each lens multiple vision-correction zones for near, intermediate, and distance visions.

- **Binocular Progressive System** is featured in most of CooperVision's multifocal lenses. According to CooperVision's literature, "What sets these lenses apart from some others that correct for presbyopia is their ability to be tailored to each patient's prescription. Doctors can choose a center-distance or center-near design based on the sphere and, for many patients, add the appropriate power needs," which also creates clearer vision.

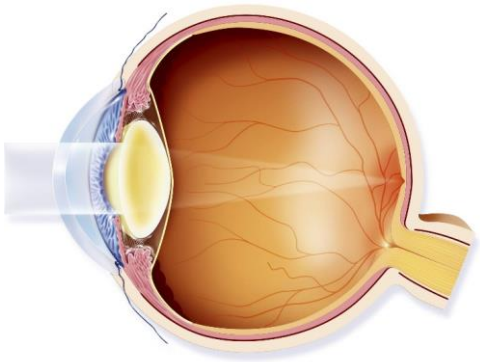
- **Digital Zone Optics** is only used in Biofinity Energys lenses. This design aims to cut down symptoms of DES (digital eye strain) by easing stress on the ciliary muscles. It claims to do this by using multiple aspheric curves on the front surface of the lens (the digital zone). The lenses are meant to distribute power more evenly, with most of the positive power in the center of the lens. This purports to cut down on the accommodative stress caused by using digital devices.

- **Optimized Toric Lens Geometry** incorporates three features which are used in CooperVision's Avaira Vitality toric, Biofinity toric multifocal, and MyDay daily disposables which include some features that are intended to keep the lens from moving, which in turn creates clearer vision. The three key features are a curved back surface that allows the lens to better hug the eye to maintain its position, a larger toric zone that helps with visual performance, and a uniform lens thickness (less than 10% variance in each cross section) in each horizontal cross section to help further improve visual clarity.

- **PC Technology** is a wetting agent used in the Proclear lens lines. It consists of phosphorylcholine, which is not found naturally in the tear film. It is a moisture-loving polymer that when integrated into a contact lens promotes continuous hydration of the lens and the eye. Cooper claims that this technology allows the Proclear lenses to maintain 96% of their original water content after 12 hours of wear.

- **WetLoc Technology** is used in Clariti 1-day, Clariti 1-day toric, and Clariti 1-day multifocal lenses. WetLoc technology is CooperVision's nomenclature for the silicone-hydrogel material of the lenses, which helps prevent dehydration.

Cornea: The transparent covering of the eye that covers the iris, pupil and anterior chamber and provides most (66%) of the eye's optical power. The cornea consists of 6 layers: the epithelium, Bowman's membrane, stroma, Dua's Layer, Descemet's membrane and the endothelium. The optical component of the cornea produces an inverted, reduced image on the retina, which is then enlarged and "righted" by the brain.



Corneal Abrasion: An injury of the cornea in which the epithelium is scraped off.

Corneal Lubrication: An essential component of safe contact lens wear, as it keeps the cornea moist, and the contact lens hydrated and moving properly on the cornea. This is particularly important because the cornea is mainly avascular and receives oxygen from the tear film. Proper corneal lubrication may be aided with the use of over-the-counter natural tear drops. In some cases, punctual plugs are also needed to increase the quantity of tears, or Restasis eye drops may help to increase the quality and/or quantity of the tear film.

Corneal Pannus: Infiltration of the cornea by abnormal blood vessels in an otherwise avascular tissue. This is typically the body's defensive response to a lack of oxygen to the cornea which can be caused by an improper fitting contact lens and/or sleeping in contact lenses.

Corneal Ulcer: A discontinuity or break in the epithelial tissue of the cornea associated with inflammation in the cornea, which could be sterile or may be caused by bacterial, fungal or viral infection. This is commonly seen in patients who over wear and/or sleep in their contact lenses and requires immediate treatment because it can be vision threatening, especially if it is located in the area of central vision.

Demulcents: Agents used in CL solutions, such as hyaluronic acid, which soothes irritation by forming a film over an epithelial surface. The term "demulcent" is sometimes used interchangeably with the term "lubricant."

Dry Eye Syndrome. Insufficient lubrication or moisture of the eye may result in dry eye syndrome. Its symptoms range from mild irritation to ocular inflammation of the anterior tissues of the eye. Persistent dryness, scratching, and burning are sure signs of dry eye syndrome.

Diopter: The unit of measure used in optics and opticianry to designate the refractive power of a lens.

Epithelium: The outermost layer of the cornea, situated between Bowman's membrane and the tear film. This is the part of corneal tissue that is removed with the excimer laser during laser vision correction.

Eyestrain: Discomfort or fatigue of the eyes usually after near-vision tasks. Sometimes abbreviated DES (Digital Eye Strain) and formerly CVS (Computer Vision Syndrome).

Farsightedness: See Hyperopia

FDA Stand-Alone Criteria: This criterion evaluates the innate antimicrobial efficacy of a contact lens disinfectant within the recommended time. After inoculation, the solution must show three log kills for bacteria, and one log kill for fungi.

FDA Regimen Criteria (rub, rinse, and soak): After inoculation of the lenses, the regimen must reduce the levels of bacteria and fungi from 1 million to less than 10 for the lenses in solution.

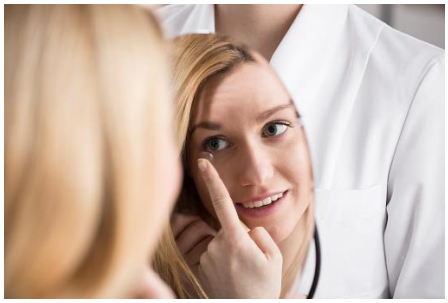
FDA No-Rub Requirement; Must show both regimen antimicrobial and cleaning efficacy without rubbing.

Giant Papillary Conjunctivitis (GPC): Inflammation of the conjunctiva on the undersurface of the upper eyelid often due to an allergy to soft contact lens material and/or overwear.

Hard Contact Lens: Contact lens made of a rigid plastic material that floats on the corneal tear film.

Hyperopia (Farsightedness): A refractive error of the eye created by an underpowered eye that is too short for its optical power. Light rays from an object enter the eye and come to a focus beyond the retina, creating a blurry image. This condition can be corrected with plus powered convex lenses in spectacles and contact lenses or with laser vision correction. Younger patients may be able to compensate for this naturally.

I&R Session (Insertion and Removal Session): An instructional session in which an eye-care professional (ECP) instructs a first-time contact lens wearer in the placement, removal, and cleaning of contact lenses.



Irregular Astigmatism: A type of astigmatism producing distorted imagery in which the light rays are not oriented 90 degrees apart. It may be due to contact lens wear, trauma, inflammation as well as developmental abnormalities.

Johnson & Johnson Vision: Although Johnson & Johnson has been around since the 1870s, Johnson & Johnson Vision was founded in Santa Clara, California in 1976. It currently has headquarters there and in Jacksonville, Florida. Acuvue by J&J is one of the most recognizable

CL name brands in the world. It is a popular brand that offers solutions for refractive errors across the visual spectrum. As of this writing (November 2022), the company carries 15 varieties of soft lenses. In what is certainly marketing genius, J&J incorporates the Acuvue name in nearly all its lenses. Its sub-brands include Acuvue Oasys, Acuvue Vita, Acuvue Moist, and Acuvue TruEye. Some commonly used terms within J&J's product line include Lacreon Technology, HydraClear1, HydraClear Plus, HydraLuxe, HydraMax, and Transitions Light Intelligent Technology. Each of these innovations (with the exception of Transitions technology) are designed to improve lens hydration and, therefore, patient comfort.

- **Lacreon Technology** was first introduced by J&J in 2010 and since has evolved into other incarnations such as HydraClear, Hydra Plus, etc. Its purpose is to mimic the mucin layer of the tear film and help to keep it stable. It accomplishes this by embedding a long chain wetting agent called polyvinylpyrrolidone (PVP) throughout the lens matrix. PVP is amphiphilic, which means it has both hydrophilic (water-loving) properties and lipophilic (lipid-loving) properties.

- **HydraClear 1, HydraClear Plus. And HydraMax.** Specific lens designs differentiate them from each other within the J&J line. For example, HydraClear Plus contains a higher amount of PVP than HydraClear 1, while HydraMax contains the most PVP among the three, which means it offers the highest level of moisture and comfort. Each of the three are made of different polymers as well: HydraClear Plus lenses are made of senofilcon A, HydraClear 1 lenses are made with narafilcon A, and HydraMax use senofilcon C.

- **Transitions Light Intelligent Technology** is available only in Acuvue Oasys with Transitions contact lenses. These lenses are photochromic! So, just like the spectacle Transitions lenses, they darken in the sunlight, and return to a clear state indoors. The company claims that the lenses will return to their clear state in about 90 seconds. J&J also claims that this mechanism works while still allowing the lenses to block out 100% of UVB rays. One disclaimer that J&J makes is to warn patients that Transitions contact lenses are not an adequate substitute for UV-absorbing, protective eyewear (sunglasses) because they do not cover the entire eye and its surrounding area. Patients should continue to wear quality sunglasses for maximum protection.

Keratoconus: A degenerative corneal disease which may affect vision and is characterized by corneal thinning and cone-shaped protrusion of the central cornea. This disease typically affects both eyes, although not symmetrically, and usually becomes apparent in the patient's teens or twenties. This is typically corrected with a rigid gas permeable (RGP) contact lens.

Menicon is a Japanese-based company that was Japan's first and largest manufacturer of contact lenses. Founded in 1951, it has a somewhat narrower product line than most other soft contact lens companies. All their lenses are marketed under the name Miru, which means "to see" in Japanese. Menicon offers spherical, toric, and multifocal lenses to be replaced daily or monthly.

MPS. Multi-Purpose Solution. One contact lens solution that cleans, rinses, and disinfects.

MPDS. Multi-Purpose Disinfecting Solution. Same an MPS, with higher microbiocidal (kills bacteria and viruses) requirements.

Multifocal Contact Lens: A soft contact lens that incorporates corrections for distance, intermediate, and near vision in one lens.

Myopia: (Nearsightedness): A refractive error of the eye created by an overpowered eye which has too much optical power for its length. Light rays coming from a distant object are brought to a focus before they reach the retina, creating a blurry image. Nearsighted people can read clearly without glasses, but distance vision is blurry. This condition can be corrected with minus powered, concave lenses in spectacles and contact lenses or with laser vision correction.

Nearsightedness: See Myopia

Ophthalmic Technician: An allied health professional (both certified or non-certified) who performs preliminary diagnostic testing for, and under the supervision of, an ophthalmologist.

Ophthalmologist: A surgeon and medical doctor who specializes in the diagnosis and treatment of refractive, medical, and surgical problems related to eye diseases and disorders, as well as vision conditions with spectacles and contact lenses.

Ophthalmology: Medical specialty which deals with the eye, its function, diseases, including diagnosis and medical as well as surgical management of these diseases.

Optical: Of or pertaining to optics.

Optical Power: The degree to which a lens (contact or eyeglass), mirror, or other optical system converges or diverges light.

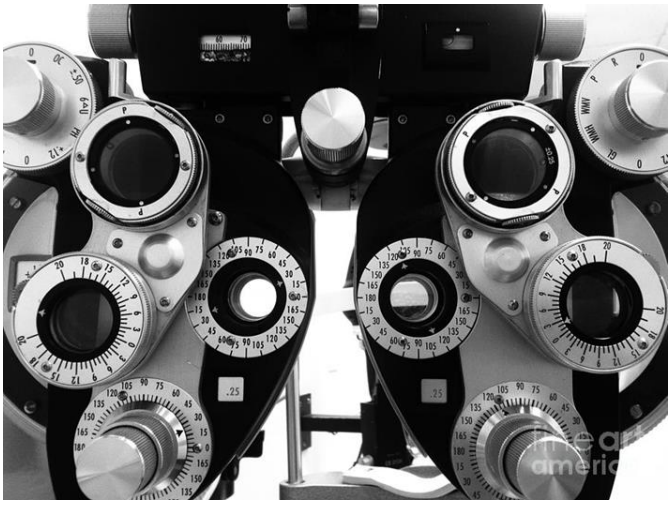
Optician: In Florida, a licensed professional who makes and adjusts optical aids such as spectacles and contact lenses from a prescription supplied by an ophthalmologist or an optometrist. Interestingly, according to the definition of ophthalmic dispensing found in FS 484, part 1, and I&R session (see separate listing here) is something a non-licensed person may conduct – without the direct supervision of another ECP.

Optics: The branch of physics that deals with the properties of light and vision, for instance its refraction and reflection by lenses, prisms, mirrors, and the eye.

Optometrist: Doctor of Optometry. (an O.D.) specializing in vision problems, treating vision conditions with spectacles, contact lenses, and vision therapy, and may also prescribe medications for certain eye diseases.

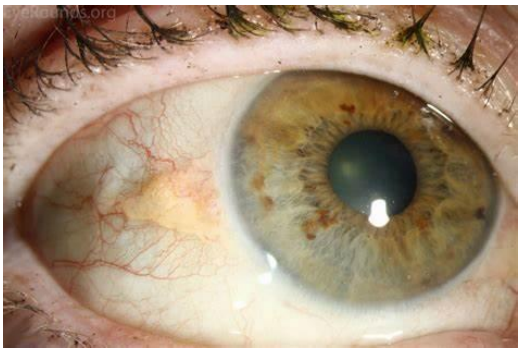
Optometric Assistant: An optometric assistant may also be referred to as optician's assistant and it is their job to assist opticians and optometrists in vision care centers. There are customer-service, clerical, and technical aspects of the job. The customer service component deals with patients as optometric assistants greet customers, answer questions, and conduct follow-ups. The clerical duties involve documenting patient histories, scheduling appointments, filing insurance claims, and managing inventory. The technical duties may include any such tasks as the supervising medical professional feels comfortable delegating to the optometric assistant.

Phoropter: Refraction device which incorporates a series of spherical and cylindrical lenses, which also includes prisms, occluders and pinholes. This device is used to determine an eye's refractive error as well as a prescription for spectacles and contact lenses.



Pingueculae. Pingueculae are slightly yellowish lesions that form on the sclera, usually close to the cornea's edge. While found mostly in middle-aged and older people, children may sometimes develop them as well. They are usually benign and are caused by prolonged, unprotected exposure to sunlight. The usual treatment includes sun protection and lubricating eye drops,

though in some more severe cases where the pinguecula is interfering with vision, surgical removal is indicated.



Presbyopia: Literally “old eyes” in Greek, presbyopia is the diminished power of accommodation due to loss of elasticity of the crystalline lens of the eye which changes shape to change focus between distant and near objects. Usually affecting them around age 40, patients with presbyopia are unable to see up close and need a bifocal or multifocal lens, in either spectacles or contact lenses, for near-vision tasks.

Pterygia. Pterygia are benign, usually wedge-shaped growths of fibrovascular tissue, typically located on the surface of the sclera. As with a pinguecula, prolonged UV exposure is usually the cause of a pterygium. Treatment depends on the pterygium's size and the symptoms caused by the pterygium. If a pterygium is small but becomes inflamed, your eye doctor may prescribe lubricants or possibly mild steroid eye drops to reduce swelling and redness. In some cases, surgical removal of the pterygium is necessary.

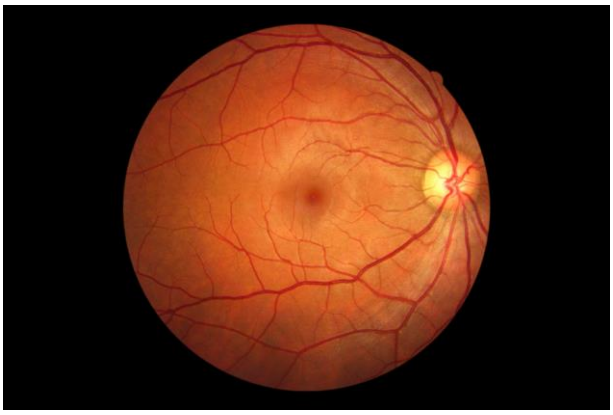
Punctal Plugs: Small silicone (permanent) or collagen (absorbable) inserts that are placed inside the punctum (openings) of the eyelids to prevent normal tear drainage. These plugs are used to treat dry eyes to keep natural tears on the eye longer to help the cornea and conjunctiva stay moist.

Refract: To bend. In optics (and specifically eyeglass or contact lenses), light rays are refracted when they pass through different types of lenses.

Refraction: A subjective determination of an eye's refractive error as well as the best prescription for spectacles and contact lenses to correct it. This test involves a series of lenses in graded powers which are presented to the patient to determine which lens, or combination of lenses, provides the sharpest visual acuity. (See Phoropter)

Refractive Error: Optical defect in which parallel light rays are not brought to a sharp focus precisely on the retina, producing a blurred retinal image. Types of refractive errors include myopia, hyperopia, astigmatism, and presbyopia, which can be corrected with spectacles, contact lenses and /or refractive surgery.

Retina: Light sensitive nerve tissue in the eye, composed of rods and cones, which converts images from the eye's optical system into electrical impulses that are sent along the optic nerve to the brain to be interpreted as vision.



Rigid Gas Permeable Contact Lens (RGP Lens): Rigid plastic contact lens that rests on the cornea and is used for correcting a refractive error; smaller in diameter than a soft contact lens.

Soft Contact Lens: A hydrophilic (water-absorbing) contact lens that rests on the cornea and is used for correcting a refractive error or protecting a damaged corneal surface.

Spectacles (Eyeglasses): Optical aid which incorporates a combination of the appropriate lenses (concave, convex and toric) to correct various refractive errors. There are many types of

spectacles that include: Bifocal, trifocal, single vision, progressive (multifocal), and Transitions lenses.

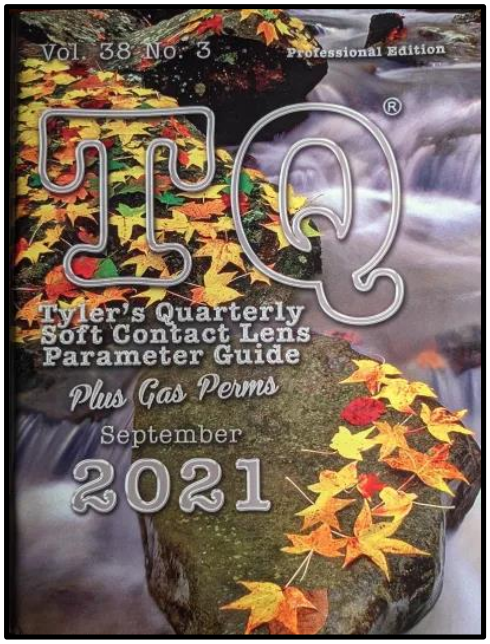
Stye. A stye (or sty) develops when a gland at the edge of the eyelid becomes inflamed or infected. It resembles a small pimple and may form on the inside or outside of the lid. Styes do not affect vision and may occur at any age. Styes are caused by a staphylococcal bacterium. This bacterium is commonly found in the nose, and it is believed that styes are mostly caused by rubbing the nose first, and then transferring the bacterium by rubbing the eye.

Most styes heal on their own within a few days. You can encourage this process by applying hot compresses for a few minutes, three times a day, over the course of several days. This will relieve the pain and bring the stye to a head, much like a pimple. The stye ruptures and drains, then heals. Never "pop" a stye like a pimple; allow it to rupture on its own. If you have frequent styes, your eye doctor may prescribe an antibiotic ointment to prevent a recurrence. Styes formed inside the eyelid either disappear completely or (rarely) they may rupture on their own, and they can be more serious. These styes may need to be opened and drained by your eye care practitioner.

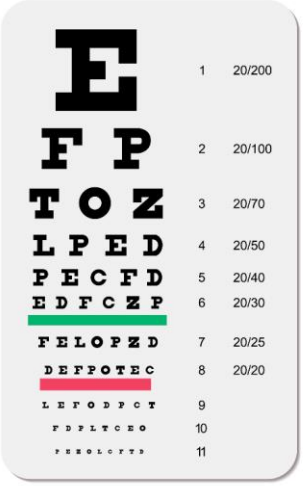
Tear Film: Liquid that bathes the cornea and conjunctiva which consists of 3 layers: the outer oily layer secreted by the meibomian glands, the middle aqueous layer secreted by the lacrimal glands, and the inner mucin layer produced by the conjunctival goblet cells.

Toric Contact Lens: A contact lens that incorporates spherical and cylindrical components which is used for correcting astigmatism.

Tyler's Quarterly Soft Contact Lens Parameter Guide: *Tyler's Quarterly*, which began publication in 1983, is the industry's most comprehensive guide to soft and gas-permeable contact lenses. Find more information or subscribe at www.tylersquarterly.com



Visual Acuity: Assessment of the eye's ability to distinguish object details and shape, using the smallest object that can be seen at a specified distance, typically at 20 feet. For example, if a patient has 20/20 visual acuity (VA) that means that standing 20 feet away from the eye chart, he or she can see objects that were designed to be seen from 20 feet away. On the other hand, someone who has 20/40 VA must stand 20 feet away to see letters or objects that someone with 20/20 vision could see from 40 feet away.



Wetting Agent: Lubricates the lens surface and decreases the wetting angle - the angle at which a liquid effectively interfaces with a solid. (Wetting angles are measured in degrees between 0-180. A wetting angle of 0º denotes perfect wettability, while an angle of 180° represents perfect non-wettability. Angles between 0-90º are considered angles of high wettability, while angles between 91-179° are considered angles of low wettability.)

III Tomorrow

Scleral Lenses. Somewhere between the technology of tomorrow and the technology of today (and frankly, yesterday), lies the world of scleral contact lenses. Scleral contacts lenses are large, rigid gas permeable (RGP) lenses that not only cover the cornea but also extend to cover a large part of the sclera (the white part of the eye). A traditional rigid gas permeable lens averages about 9.0mm in diameter, while scleral lenses vary from 14 to over 20mm in diameter. Because the fitting of scleral lenses involves mapping the entire cornea, and each lens is custom-made and fit for each patient, the cost can be many times more than that of traditional lenses. The constant moisture that wearing scleral lenses provides does not only add to the comfort, but it is also a very effective preventive measure against injuries to the cornea, such as abrasions and dry eye disease. Because of the rigid surface of the scleral contact lenses, they are also great for providing superior correction for astigmatism.

- **Zenlens** by Bausch + Lomb are scleral lenses that boast two new technologies: **SmartCurve Technology** and **MicroVault Technology**. Because the scleral lenses are custom-fit, finding the perfect configuration is sometimes challenging. B+L claims that their SmartCurve technology is able to "automatically adjust design attributes when a lens parameter is modified to ensure the patient receives a predictable fit." For example, if you increase limbal clearance, B+L says that other lens parameters (such as base curve and sagittal height) will automatically adjust. When it comes to their MicroVault technology, it designs a "flute" to help the lens fit around a pinguecula. It can be applied to any lens design and works by countering the lens around obstructions (such as pingueculae) to help provide a more comfortable fit. B+L also claims, "The mechanism of the MicroVault feature may remove the need for the physician to notch out an area of the lens in order to achieve a proper fit."

Dissolving Nano-Wafer Contact Lenses. Teams at both Purdue University and the University of Michigan are working on nano contact lenses (about 1/20th the thickness of a conventional soft lens) designed to administer eye medications. As their name implies, once the lenses (which have no optical, corrective properties) have administered the medication, they simply dissolve away.

Telescopic Contact Lenses. Designed for patients suffering from ARMD (age-related macular degeneration), these lenses are currently in the prototype and research stage of development in Sweden. For more information, follow this link: https://lowvisioneyeglasses.com/new-treatments/telescopic-contact-lens.html

Night-Vision Contact Lenses. Supposedly being worked on by the military, night-vision contact lenses may soon be more fact than science fiction. But as of this writing (November 2022) they are still on the Christmas wish list for every Doomsday Prepper who needs vision correction!

Commented [AR4]: lol
GOT THEIR ASSES!!

3-D Printed Contact Lenses. Like night-vision CLs, 3-D printed contacts are mostly in the experimental stage. Researchers are developing polymers that could be used to create contact lenses using a 3-D printer. One company is specifically attempting to create 3-D printed CLs to treat color blindness. Additionally, an article which appeared in the May 11, 2022, online edition of *Optometry Times* magazine, claims that researchers in India at the Manipal Academy of Higher Education are "using a novel approach to 3D printing by developing the self-moisturizing contact lenses using AutoCAD and stereolithography, which is a common 3D-printing technology."

Other Advances. There are always exciting innovations on the horizon, and the last two that come to mind are glucose-monitoring contacts and contacts with anti-reflective (AR) coatings. The former is being designed for diabetic patients and will work in conjunction with their Smartphones, and the latter will have the same characteristics as spectacle lenses with AR…someday.

Final Assessment

1. What word is sometimes used interchangeably with the word lubricant and soothes irritation by forming a film over the epithelial layer?

    a. Chelator
    b. Demulcent
    c. Accelerator
    d. Lacrimal

2. A rare disorder that be caught by being exposed to contaminated water in a lake, pool, or hot tub is:

    a. Giant Papillary Conjunctivitis
    b. Presbyopia
    c. Acanthamoeba Keratitis
    d. Menicon

3. First introduced by Johnson & Johnson in 2010, its purpose is to mimic the tear film and help keep it stable. What is it?

    a. Lacreon Technology
    b. ProBalance Technology
    c. Wet-Loc Technology
    d. AquaComfort Technology

4. What is the outermost layer of the cornea?

    a. Descemet's membrane
    b. Endothelium
    c. Bowman's membrane
    d. Epithelium

5. A curved back surface, a large toric optic zone, and uniform lens thickness are three characteristics present in:

    a. Optimized Toric Lens Geometry
    b. PC Technology
    c. Lacreon Technology
    d. ProBalance Technology

6. Used in some of CooperVision's spherical lenses, which technology converges light rays more efficiently to produce a single point of focus?

    a. ActivControl Technology
    b. Aberration Neutralizing System
    c. Digital Zone Optics
    d. Optimized Toric Lens Geometry

7. The cornea consists of ___ layers.

    a. 4
    b. 5
    c. 6
    d. 7

8. Which contact lens manufacturer is the only one to offer soft contact lenses with Transitions Light Intelligent Technology?
    a. Alcon
    b. Menicon
    c. Johnson and Johnson
    d. CooperVision

9. What is the technology called which CooperVision credits with slowing myopia in its MiSight lenses?

    a. ActivControl Technology
    b. Lacreon Technology
    c. Balanced Progressive Technology
    d. Digital Zone Optics

10. Standing 20 feet away, if a patient was reading the Snellen Chart pictured under "Visual Acuity" above, and the smallest line they can read is line 6, what is their visual acuity?

    a. 20/20
    b. 20/30
    c. 20/40
    d. 20/50

11. Found in CooperVision's MyDay and Biofinity lenses, which technology is used to increase oxygen permeability and to mitigate the drying effects of lower blink rates for users of digital devices?

    a. Aquaform Technology
    b. HydraMax Technology
    c. Wet-Loc Technology
    d. PC Technology

12. Which contact lens company offers HydraGlyde technology in many of its lenses?

    a. Johnson and Johnson
    b. CooperVision
    c. Bausch and Lomb
    d. Alcon

13. A light-sensitive membrane of the eye consisting of rods and cones is?

    a. The cornea
    b. The retina
    c. The iris
    d. The pupil

14. What is it that can remove dirt, debris, make-up, and mucin from a contact lens?

    a. Demulcent
    b. Chelator

c. Surfactant
d. Acanthamoeba

15. What is the world's most common refractive error?

a. Myopia
b. Hyperopia
c. Astigmatism
d. Presbyopia

16. Though it is usually avascular, what is the body's defensive response to a lack of oxygen to the cornea which can be caused by an improper fitting contact lens and/or sleeping in contact lenses?
    a. Corneal dystrophy
    b. Corneal abrasion
    c. Corneal pannus
    d. Corneal ulcer

17. A refractive error of the eye created by an overpowered eye which has too much optical power for its length. Light rays coming from a distant object are brought to a focus before they reach the retina, creating a blurry image. What is this refractive error called?

a. Astigmatism
b. Presbyopia
c. Myopia
d. Hyperopia

18. Menicon contact lenses are all marketed under the sub-brand Miru, which is a Japanese word that means what?

a. Light
b. To see
c. Prism
d. Clarity

19. What do the words hydrophilic and lipophilic mean, respectively?
    a. Light-absorbing; water-loving
    b. Water-loving; abrasion-resistant

c. Lipid-loving; light-absorbing
d. Water-loving; lipid-loving

20. Which CooperVision technology allows doctors to choose a center-distance or center-near design based on the sphere and, for many patients, to add the appropriate power needs to help create clearer vision?

a. Binocular Progressive System
b. Lacreon Technology
c. Transitions Light Intelligent Technology
d. Digital Zone Optics