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Patient brochure on contact lens options

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Abstract

Patients interested in contact lenses, especially new wearers, find the contact lens industry to be overwhelming and confusing. Many practices are asked, "How much are your contact lenses?" This leads to a lengthy explanation that often goes misunderstood. This patient brochure was designed to answer the many questions prospective contact lens wearers have in hopes of avoiding patient frustration, and to save optometrists and optometric assistants time in repetitively answering such questions.

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PATIENT BROCHURE
ON
CONTACT LENS OPTIONS

By

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AUTOBIOGRAPHY
OF
KRISTINE L. JOHNSON

Kristine Johnson was born and raised in Minnesota. After completing her bachelor of science degree at the University of Minnesota-Twin Cities campus, she married and resided in Fargo, ND. While waiting for her husband Kyle to finish pharmacy school, she worked full time as an optician for one year. They then moved to Beaverton, Oregon and Kris was accepted into Pacific University's Optometry Program. While attending Pacific University, Kris was treasurer of PUCO Conference Committee, and a member American Optometric Student Association. She continued to work as an optometric assistant for a local optometrist for the past four years. She and her husband bought a home in Beaverton shortly before enrollment and plan to continue living there after graduation with hopes of her practicing optometry in the area.

AUTOBIOGRAPHY
OF
SHARON A. WOLFF

Sharon Wolff received her Bachelor of Arts degree in Business Administration at Dickinson State University in Dickinson, North Dakota. After graduation she worked at Dickinson State University for a number of years before enrolling at Pacific University College of Optometry. While attending Pacific University, Sharon was a member of PUCO Conference Committee, American Optometric Student Association, AOA Contact Lens Section, AOA Sports Vision Section, and the Optometric Extension Program. Sharon plans to practice optometry in Minnesota after receiving her O.D. degree.

ABSTRACT

Patients interested in contact lenses, especially new wearers, find the contact lens industry to be overwhelming and confusing. Many practices are asked, "How much are your contact lenses?" This leads to a lengthy explanation that often goes misunderstood. This patient brochure was designed to answer the many questions prospective contact lens wearers have in hopes of avoiding patient frustration, and to save optometrists and optometric assistants time in repetitively answering such questions.

Key Words:
contact lens, soft contact lens (SCL), rigid gas permeable (RGP), daily wear, extended wear, disposable, frequent replacement, planned replacement, bifocal, astigmatism, toric, opaque, enzymatic.

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INTRODUCTION

For millions of Americans who require vision correction, the enticements for contact lenses are stronger today than ever before. Many people wear lenses not only for visual correction, but also for cosmetic reasons, versatility, comfort, convenience and treatment of ocular disease. Contact lenses can outperform glasses by providing better depth and size perception, peripheral vision, binocularity and less distortion. With continued research and development and new manufacturing techniques, we now have a wealth of contact lens design options to choose from.

In this thesis, we researched the various types of contact lenses available in order to develop an informational brochure as a means of educating the patient. The brochure will be a helpful tool in answering questions and may also serve as marketing tool for contact lens practice.

HISTORY OF CONTACT LENSES

Sir John F.W. Herschel first considered contact lenses in 1823 to improve vision by correcting corneal irregularity using a transparent medium to mold the cornea. Although the theory was feasible, no mold could be made to fit the cornea because at that time there was no anesthetic available to desensitize the cornea.[1,2,3]

In 1887, F.A. Mueller, made a giant step in the progress of contact lenses by making a thin shell of clear blown glass to be worn by a person with a diseased eyelid. It was to act as a protective bandage by preventing the lid from touching the eyeball.[1,4] The earliest corrective lens was a scleral lens designed by A. Eugene Fick in1888. Kalt and Muller used similar lenses to flatten the cornea for keratoconics.[3,4]

Josef Dallos improved the molding technique in 1932 and suggested the minimal clearance method for fitting scleral lenses to aid in lacrimal exchange. In 1943, Bier fenestrated these lenses for further improvement in tear film exchange. Feinbloom, Muller and Obrig pioneered the use of lighter plastic scleral lenses in the 1930's. Kevin Tuohy is credited by most as the inventor of the first PMMA (polymethylmethacrylate) corneal lens in 1948.[2,3,5] Further refinements to the corneal lens took place in the 1950s to improve tear exchange and wearing time.[1,3]

In the fifties and early sixties, Wechterle and Lim reported on the possible use of a hydrophilic plastic polymer, hydroxymethacrylate (HEMA) as a contact lens material and adapted the spin casting method for manufacturing these lenses. Early HEMA was called hydron and was patented in 1963. Bausch and Lomb made the first spuncast Hydron lenses in the US in 1966. In 1971, the FDA approved Bausch & Lomb's Soflens for use in the United States.[3,4,5]

Rigid gas permeable (RGP) materials became available in 1974 to give improved oxygen transmission with reasonable wetting properties. More recently Cellulose acetatebutyrate, silicone resin, silicone rubber, silicone/acrylate co-polymers, styrene and fluor/silicone/acrylate materials all have been used for contact lenses.[3]

Various types of tinted and toric soft contact lenses were developed in the 1980s. In 1981 soft extended wear lenses were introduced. Soft disposable lenses were developed in 1987 to solve many of the problems inherent in traditional soft lens wear, including deposits, lens deterioration, giant papillary conjunctivitis, and other problems associated with patient non-compliance.[5,6]

There are two basic types of contact lenses being used today, soft (hydrogel) and rigid gas permeable (RGP) lenses. Both types of lenses may be prescribed for daily wear or extended wear.

Soft Contact Lenses

Soft lenses are produced from various hydrophilic polymers where water content ranges from 28 to 79% water. They are flexible and conform to the shape of the cornea.[5] The lens should fully cover the corneal surface and have a slight scleral overlap. It should move slightly from its primary position with a blink or when nudged gently by digital pressure through the lower lid. The large size of the lens permits the lid margins to glide over its surface without impinging on the edges of the lens, which is one reason for soft lens comfort .[2]

Conventional daily wear lenses are removed nightly and require daily cleaning and disinfecting. The recommended replacement interval is 12 months. The optometrist may shorten this interval depending on the individual wearer.

Advantages of Soft Lenses

Initial comfort

Short adaptation period

Easy to fit

Good for intermittent wear

More stable on the eye

Less chance of trapped foreign body versus rigid

Reduced incidence of spectacle blur

Less flare and photophobia

Disadvantages of Soft Lenses

Slight reduction in quality of vision

Astigmatism not corrected with spherical lens

Increased risk of infection

Prone to deposit formation

Lack of durability

Requires more time for care

Greater risk of non-compliance

More expensive to maintain

Difficult to verify

Indications of Soft Lenses

Motivation to wear and care for soft contact lenses

Failure at previous attempts to wear rigid lenses

Low refractive astigmatism

Very low refractive error

High refractive error

Occasional wear

Occupations where spectacles would be inappropriate (athletes, models, actors, dancers, etc.)

Nystagmus

Ocular albinism

Aniridia

Patients with wide palpebral fissures

Contraindications for Soft Lenses

Poor tear layer

Substantial astigmatism (>3 D)

Irregular astigmatism

Difficulty handling soft lenses

Poor hygiene

Chronic allergies

Corneal irregularities

Monocular patients

Inflammation or disease of the anterior segment

Systemic diseases which may make patients more likely to experience complications (diabetes, acne rosacea, etc.)

Chronic ocular disease

Lack of motivation

Exposure to hazardous environments (extremely dry environments, exposure to volatile chemicals)

Use of certain systemic medications (may lead to tear film problems

Soft Extended Wear Contact Lenses

Extended wear means the lens may be worn overnight. The Food and Drug Administration recommends a maximum wearing time of 1 to 7 days due to ocular complications which can arise from wearing the lenses for an extended period of time.

Advantages of Soft Extended Wear Lenses

Convenient (less handling & maintenance)

Lower cost for cleaning solutions (less needed)

Instant vision during the night

Disadvantages of Soft Extended Wear Lenses

Increased risk for complications

Need to be replaced more often than daily wear

More follow-up visits

Fragility of lenses

Deposit formation

Lens dehydration

Indications for Soft Extended Wear Lenses

Infants and young children

Elderly patients

Lack of manual dexterity

Successful, compliant soft daily wear contact lens wearers

Contraindications of Soft Extended Wear Lenses

Non-compliant patients

Exposure to hazardous environments

Poor hygiene

Dry eye

Preexisting ocular disease

Presence of significant ghost vessels or neovascularization

Disposable Soft Contact Lenses

In essence all lenses are disposable and it's up to the practitioner to decide when the lens should be discarded, however, the Food and Drug Administration considers an item disposable if it is used once and then discarded. According to this definition, there are two types of disposable lenses, one is disposed of on a daily basis, the other is discarded after one week of extended wear. No cleaning regimen is required.[7,8]

The International Committee on Contact Lenses recommends wearing disposable contact lenses on a daily wear basis and that wearers of disposable lenses be examined every 3 to 6 months, more frequently if the lenses are worn overnight.[5,9]

Frequent Replacement Soft Contact Lenses

Frequent replacement lenses are lenses that are replaced on a planned schedule and are available as daily wear or extended wear and in various replacement frequencies. Lenses can be replaced after 2 weeks, monthly, or at 2-, 3-. 4-, or 6 month intervals. With insertion of a sterile lens at more frequent intervals, there is increased comfort and less chance of ocular complications.[5]

Tinted Soft Contact Lenses

Lens tints were first developed to enhance iris color, but now are also applied to lenses to change the iris color, enhance cosmetic appearance, provide light protection, and improve patient handling.

Visibility tints are tints that are strong enough so the lens can be seen in a lens case and light enough so that it won't affect iris color. These tints are helpful when one is looking for a lens or inserting or removing lenses. Bulk tinted lenses have the dye added during the polymerization process and produces a lens that is tinted from edge to edge and across the optic zone. Intensity of the tint is proportional to the thickness of the lens. Another method involves tinting the finished lens. This method allows a more uniform tint, allows for a clear pupil zone and/or clear periphery if required. This type of lens would be indicated for a patient who requires a high powered lens.[10,11]

Enhancement tints modify the color of a light iris. They are manufactured in a similar manner as handling tints, bulk tinted or masked. It is possible to specify a pupil diameter and tinted zone diameter in individually manufactured lenses. Enhancement tints have little effect on visual performance but my have a slight effect in adverse lighting conditions. This problem can be overcome by using lenses that have a clear pupil zone.[10,11,12]

Opaque tints can produce a dramatic change in eye color. These lenses can also be used to improve the appearance of a disfigured eye, to provide glare protection in certain pathological conditions such as albinism and traumatic aniridia, treatment for monocular or binocular diplopia, and as occlusion therapy in amblyopia.[10,12,13] The opaque substance used in the tinting process can cause a reduction in lens oxygen transmissibility.[10]

Some lenses are available with a UV inhibitor which blocks UV-B and most UV-A wavelengths thus providing protection for the cornea and crystalline lens against these wavelengths. Lenses which reduce the amount of light incident on the cornea may be valuable for those patients with acute photophobia. The major disadvantage of these lenses is their lack of flexibility in variable lighting conditions.[10]

Rigid Gas Permeable Lenses

Rigid gas permeable (RGP) lenses are made of a variety of hydrophobic but oxygen permeable materials. They are more flexible than hard (PMMA) contact lenses which were used in the past, but less flexible than soft contact lenses. These lenses provide excellent vision, ocular health, durability and easy cleaning but typically have reduced initial comfort and require a regular wearing schedule.[2,5,6]

Advantages of Rigid Gas Permeable lenses

Better visual performance

Less compromising to ocular health

Longer lens life, more durable

Resist deposits

Reduction in myopia progression

Ease of handling

Capability of in-office modification

Lower costs of lenses and care system

Simplified care systems

Spherical lenses can correct moderate amounts of astigmatism

Disadvantages of Rigid Gas Permeable Lenses

Initial discomfort

Longer adaptation period

Difficult to wear on intermittent schedule

More difficult to fit than soft contact lenses

Increased susceptibility to foreign body entrapment

More difficult to inventory

Difficult to achieve on-eye stability

Difficult to adjust to image movement on blink

Indications for Rigid Gas Permeable Lenses

Soft lens dropouts due to poor vision, lens deposits, or GPC

Difficulty handling soft lenses

Moderate dry eye or poor quality tear film

High myopia

Astigmatism

Keratoconus

Corneal graft

Contraindications

Lack of motivation to wear RGPs

Fear discomfort of adaptation

Patients who aren't concerned with crisp, clear vision

Windy, dusty environments

Intermittent lens wear

Difficulty handling and removing RGPs

Low spherical refractive error (+/- 2.00 D)

Contact sports

Monocular patients

Inflammation or disease of the anterior segment

Chronic allergies

Chronic ocular disease

Abnormal lid function

Systemic diseases which may make patients more likely to experience complications (diabetes, acne rosacea, etc.)

Rigid Extended Wear Lenses

Rigid extended wear contact lens materials may provide a safer, healthier alternative than hydrogel lens materials. They allow greater oxygen transmission, have less surface deposition and because of the smaller size do not cause limbal compression or seal off. Frequent follow-up care is especially important with extended wearing schedules to permit early detection of potential problems and to avoid more serious consequences.[5,14]

Advantages of Rigid Extended Wear Lenses

Instant vision during the night
Superior optics and visual performance
Verifiable and reproducible parameters
Ability to do in-office modification
Easier care regimens
Less risk of infections versus soft
High oxygen transmissibility
No lens dehydration
No lens absorption
No limbal compression/seal off
Longer lens life versus soft
Less expensive
Fewer deposit problems

Disadvantages of Rigid Extended Wear Lenses

Increased risk of lens loss
More difficult to fit
Increased susceptibility to foreign body entrapment versus soft
Lens warpage
Lens breakage
Possibility of lens adhesion

3 and 9 o'clock staining

Increased lens awareness

Indications for Rigid Extended Wear Lenses

Successful rigid daily wear contact lens wearer

Good personal hygiene

High motivation

Contraindications for Rigid Extended Wear Lenses

Non-compliance with care regimen

Poor hygiene

Exposure to hazardous environments (dusty, extremely dry environments or exposure to volatile chemicals)

Lack of motivation

RGP daily wear failure

Chronic use of antihistamines

Diabetes

Immunosuppressed individuals

Keratoconus

Penetrating keratoplasty or radial keratotomy patients

Previous corneal abrasions or scarring

Pterygium

Significant peripheral corneal or conjunctival staining

Ocular redness or engorged limbal vessels

Mucus or aqueous deficient tear films

History of lid inflammation

Corneal dystrophies

Significant corneal staining

Toric Contact Lenses

In the past, many astigmatic patients were told they couldn't wear contact lenses, but with current technology, almost any astigmat can successfully wear contact lenses. The degree of astigmatism at which one must consider a toric lens is different for soft lenses than for rigid lenses. A rigid spherical lens can often neutralize up to 3.00 D of corneal astigmatism, whereas a spherical soft lens can mask up to about 1.00 D of corneal astigmatism.[6,15]

When a patient's corneal astigmatism is between 0.75 D and 2.00 D a toric soft lens or a spherical RGP lens could be used. For 2.00 D to 3.00 D of corneal astigmatism a spherical RGP can usually be fit, and for over 3.00 D of corneal astigmatism a toric RGP would be required.[6] Soft torics can be custom designed for moderate to high astigmatism also.

There are 3 different types of toric RGP's available, front torics, back torics and bitorics. Front torics are useful for patients with relatively spherical corneas who have residual astigmatism or when a spherical lens used to correct oblique cylinder creates some against-the-rule astigmatism.[6,10] Back torics are useful when the patient has against-the-rule astigmatism associated with against-the-rule corneal toricity and greater refractive astigmatism than corneal astigmatism.[15] Bitorics are the most widely used toric RGP lens. They have cylinder on both the front and back surface. The toric back surface fits the corneal toricity and the toric front surface adjusts for the unwanted cylinder correction induced by the toric back surface. Bitorics are useful for significant corneal astigmatism with residual astigmatism and for significant corneal astigmatism without residual astigmatism when a spherical lens will not position adequately.[2,15]

Bifocal Contact Lenses

Bifocal contact lenses and rigids were developed around the same time. Attempts to first correct presbyopes with contact lenses were as early as 1936. William Feinbloom had the first patent on a bifocal contact lens at this time. There are two basic lens designs that fully correct presbyopia; simultaneous image bifocals and alternating image translating bifocals.

Most simultaneous image designs use a difference in curvature or index of refraction within the pupillary zone to allow both distance and near vision. The patient must pay attention to the desired image and ignore the blurred image. This requires a stable, centered fit.

Alternating image or translating bifocal lenses utilize two distinct zones, one for distance and the other for near. These lenses are made using two different indices of refraction on each side or by grinding two different curvatures together. The ideal situation is so that only the distance zone covers the pupil when a distant object is being viewed, and only the near zone covers the pupil for reading. When this occurs, these lenses provide the best distance and near vision, provided there is adequate movement.

There are three simultaneous image bifocals; concentric, aspheric and diffraction lenses. Simultaneous image lenses like the deCarle and Moss-Arner were created with two power zones by grinding different curvatures on the posterior optic zone with the distance zone being steeper. The central distance zone is small so that the peripheral pupil diameter is partially covered by the near zone.

Later designs used a multifocal series of progressively steeper annular zones resulting in higher plus power as you move out toward the periphery. These lenses are now made in an aspheric design. The size of the patient's pupil plays a big role in sucess. During daylight hours the pupil is constricted so distance viewing conditions are at their optimum. However, in the evening when the pupils are dilated, the near zone is larger and there is a decrease in distance viewing and resultant flare from lights.

The diffraction bifocal can be an aspheric or a concentric zone lens. Centration is less important because the light that enters the pupil contributes to distance and near vision equally. Destructive interference is also a benefit of this design because it reduces the extraneous light contributing to the out-of-focus image. The central portion has grooves called eschelets on the back surface of the lens. The add power is determined by the diameter and quantity of these eschelets. Their depth determines the amount of light transmitted. Closer spacings and a higher quantity of the eschelets give a higher add power.

There are two translating alternating image bifocals; segmented and concentric. The Bicon was the first translating bifocal with an annular design. It had a central zone where the curvature was flatter of about 4-6mm and an outer, steeper zone for near vision.

A segmented bifocal looks similiar to a spectacle lined bifocal and only one section is positioned in front of the pupil at a time. Its sucess also requires stabilization. Using prism or adding a flange with a minus lenticular to the near portion will help accomplish this. The prism ballast, also called a wedge construction, consists of a thicker base and a thinner apex to control orientation. The lids push the thicker portion away, or down. Complete translation rarely occurs, so there is often a little simultaneous image effect.

Soft Bifocal Lenses

Soft bifocal lenses are also available in both translating and simultaneous image designs.

Alternating image translating bifocal lenses are only available in crescent or flat top designs. Stability features are again important to make the lens sucessful. Similiar stability features are used in the hydrogel bifocal lens that are used in rigid gas permeable lenses (wedge construction, truncation, lid-lens interaction).

Complications with hydrogels include hypoxia due to increased lens thickness cutting down transmissibility in the periphery. There is also more of a problem achieving translation during down gaze because of the large design. Flatter base curves are recommended to facilitate translation. It has been found that the lower lid position has no bearing on translation. When proper translation does occur, encyclorotation may cause the reading portion to position improperly. Another complication that can occur is image jump. This is when ghost images are the result of a prismatic effect from transversing from distance to near.

Simultaneous image lenses can also be concentric zones or aspheric. These lenses focus light for distance and near objects for any position of gaze. A complex image is produced on the retina consisting of a in focus image of regard overlapped by a blurred image. In order for this concept to work, one must be able to have selective perception for the visual information of regard. Pupil size is important because it determines how much light contributes to the distance and near image. If the lens is small relative to the pupil the amount of light that enters will be greater for one focal distance thus compete neurologically with the image that is out of focus. The best performance is when approximately 50% of each zone covers the pupil.

Aspheric lens designs have a progressive power that increases in plus as you move out peripherally, in center-distance designs, or increase plus as you move centrally, in center-near designs.

Monovision

Monovision is the technique in which each eye is prescribed for a different distance. The dominant eye is most often prescribed a lens for optimum distance viewing while the non-dominant eye is fitted with a near lens prescription. There is sometimes a perceptual problem with receiving two different images and one may have decreased depth perception. For this reason higher adds, above 2.00D, do not work well because of the increased anisometropia.

Modified monovision is when one eye is fit with a contact lens for distance viewing while the other eye is fit with a bifocal contact lens. This works well for those patients whose distance vision demands exceed their near vision demands.

CONCLUSION

Many patients are interested in contact lenses but lack knowledge on the types available. Utilizing an informational patient brochure can increase your patient's knowledge, enhance your communication with the patient and decrease chair time that would normally be spent explaining the basics about contact lenses. It could also be an important tool for clinical staff to have in providing answers to the many questions that are directed towards them concerning contact lenses.

Care and consideration must go into the development of an informational brochure, as it can serve not only as an educational tool but also as a promotional publication. Informational brochures reach various potential patients and other health care professionals and may serve as a first impression of the practice.

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