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Channing A. Swanson
Pacific University

Thuy Chu Tran
Pacific University

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A review of bifocal contact lenses has been formulated to introduce the reader to research in this area. Published literature and clinical use are incorporated into a tangible model that will allow a practitioner to understand the lens contructs, optics, and successful fitting methods. The article also contains a simplified fitting guide that can aid in the fitting of bifocal contact lenses. Some complications that commonly occur with these lenses, lens candidates, and special fitting applications are explored and fitting solutions identified. The guide can be utilized as an educational model to help incorporate bifocal contact lenses into a practice.

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BIFOCAL CONTACT LENSES: A Review

By
CHANNING A. SWANSON
THUY CHU TRAN

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JAMES PETERSON, O.D.

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Title: BIFOCAL CONTACT LENSES: A REVIEW

Authors: Channing A. Swanson _____

Thuy Chu Tran _____

Advisor: James Peterson, O.D._____

Author's Biographical Data

Channing A. Swanson: Channing entered university studies at University of Colorado, Denver, Colorado in 1986. Later she recieved a Bachelor of Science degree at Pacific University, where she is currently pursuing a Doctor of Optometry degree. Optometric experience in school include trips to the Yucatan and Guadalajara. Plans are to develop a private practice in Colorado which will include specialty contact lens applications, sports vision and visual therapy.

Thuy Tran: Thuy Tran recieved a Bachelor Degree in Biology at the University of California- Los Angeles in 1990. She is currently pursuing a Doctor of Optometry degree at Pacific University College of Optometry. Her expected date of graduation is 1994. Her goal is to establish a successful private practice, capable of providing primary care, contact lenses services, and vision training.

ABSTRACT

A review of bifocal contact lenses has been formulated to introduce the reader to research in this area. Published literature and clinical use are incorporated into a tangible model that will allow a practitioner to understand the lens contructs, optics, and successful fitting methods. The article also contains a simplified fitting guide that can aid in the fitting of bifocal contact lenses. Some complications that commonly occur with these lenses, lens candidates, and special fitting applications are explored and fitting solutions identified. The guide can be utilized as an educational model to help incorporate bifocal contact lenses into a practice.

INTRODUCTION:

What are you going to tell your newly presbyopic contact lens patients when they ask about bifocal options? Modern bifocal contact lenses can offer many options. Current population statistics show that the population is aging. A successful practice will have to follow these changes. The baby-boomers are coming to that age when their vision will require some mode of near point help. Many of them are wearing contact lenses, and would consider a change from contact lenses disruptive. Jobs have changed with computerization and technology, so industries will require good alternatives. The change to presbyopia will create a compromise in all visual systems, reguardless of which regimen is implemented.

Popular options currently available for presbyopic correction include reading glasses, bifocal spectacles, progressive lenses, monovision and bifocal contact lenses. The desire to camouflage one's age, to be rid of spectacle frame discomfort and to participate in activities, such as sports, unencumbered by a pair of glasses, can be fulfilled by the various contact lens options.

Many patients may not even be aware of the existence of bifocal contact lenses, which could allow them to read in any direction of gaze, look younger, and provide the freedom to be more active and comfortable.

So often the first choice is to fit patients with monovision. This is easy, inexpensive, and leaves many lens choices open. Although it may be a good option for some, many times this modality is chosen simply because of not being comfortable or successful with binocular options. There are some problems with monovision to consider. Patients may actually grow out of their lenses because of needing a stronger near add, loss of depth perception and contrast sensitivity. As the wearer "matures" to needing over a +1.75 add, monovision creates such a compromise of vision that the patient usually has to be removed from this option[1]. Essentially, they have been disrupted twice. First, with the initial onset of presbyopia and consequently monovision adjustments. The second when they are either changed out of contact lenses or to some other system. Doesn't it make sense to pursue some of the other options first, so that the patient has a contact lens option they can wear for many years. Practitioners need some further options with presbyopic contact lens prescribing.

What are the types of bifocal contact lenses available and how do they work? Bifocal lenses are made in both RGP and soft materials. There are two general types of lenses: alternating image-translating designs, and simultaneous image designs. Many alternating image-translating designs can be compared to the types of bifocals seen in ophthalmic lenses. There is a portion of the lens for distance viewing as well as for near work. Both materials also come in simutaneous vision designs. Both lens materials offer some versatility in their design. This will be discussed in detail within each section.

There are many types of bifocal contact lenses available and the practitioner needs to be aware of them and how they work to start fitting. Many current practitioners do not fit bifocal contact lenses stating that the success rate is low. Fitting these lenses need not be a drain of time, energy, and money from a practice. This information will guide appropriate parameter adjustments, and help to obtain a satisfactory fit and a happy patient.

This paper is organized to cover most lens modalities offered to practitioners. The different lens designs, with their advantages and disadvantages, are presented. A simplified fitting guide has been assembled that can be used as a spring board to get started with each lens. A complications section is included to

address some common questions. Finally, a special fitting applications section is developed to address interesting aspects of the lenses.

BIFOCAL CONTACT LENSES

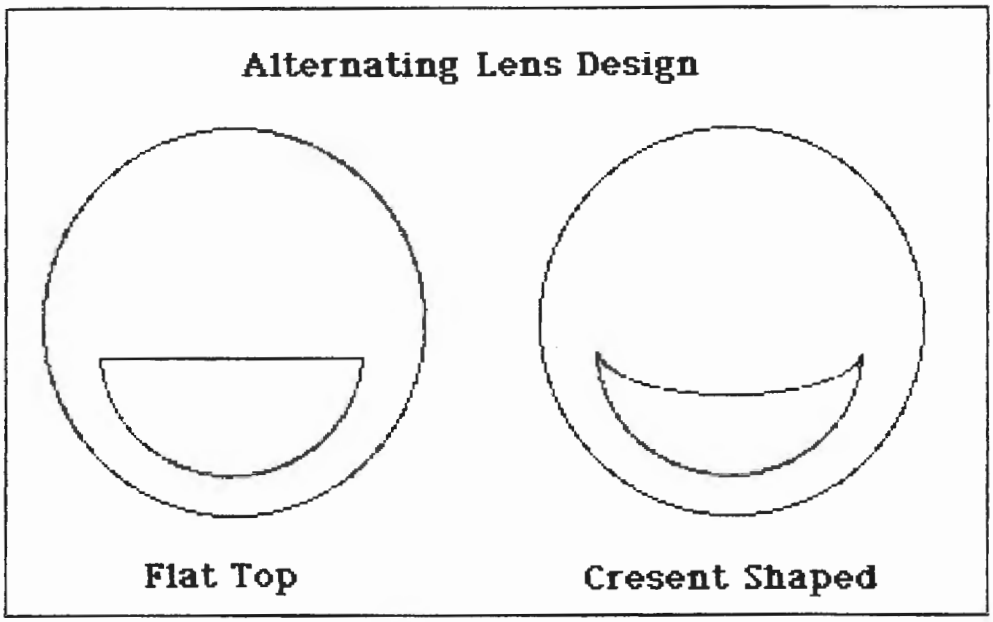
There are two main types of bifocal contact lenses. First, the alternating image translating design. Second, the simutaneous vision lens. Both rigid and soft materials are available in these designs. Each of these lenses will be defined and discussed in detail. Refer to the fitting manual to help in fitting each of the lens types.

Alternating Image Translating Lens

Alternating image translating design utilize two optic zones. There is a zone for distance vision and a zone for near vision. In the primary position of eye gaze, the distance prescription portion will be central before the pupil. When the patient looks down to read, the lens will translate upward due to the lid interaction, placing the near add portion before the pupil. This type of lens is the counterpart of bifocal spectacles, potentially allowing for the same crisp acuity achieved with spectacles. Among older presbyopes, who require an add of +1.50 or more, translating bifocal contact lenses have been very successful.

A difficulty with this lens design is that the success is dependent upon proper movement and ocular anatomy. The movement is influenced by lid tonicity with the globe, tear film, fissure size, and blink rate and quality. Coverage and translation are rarely complete, resulting in a slight degradation of the image due to simutaneous focus. When translation is adequate, good quality distance and near vision can be expected. For stable orientation, translating lens designs may use prism ballast, truncation, periballast construction, and/or structural venting.[2]

Current lenses exist in crescent shape or flat top near add design. Lenses available include the Bi-Tech (B&L), the True Bifocal (Softsite), Tangent Streak (Fused Kontacts) and the VE-ACC Translating (Salvatori). As with spectacle bifocals, an image jump occurs as the bifocal line crosses the optical axis during translation, thereby producing a ghost image. This problem may be solved using a monocentric design such as the Bi-Tech lens. In a monocentric design, the optical centers of the distance and near prescription coincide, thus preventing an image jump as the patient changes from distance to near viewing. The Tangent Streak lens is a one piece rigid bifocal. Image jump does not occur in this lens because of the presence of a tangential segment line where distance and reading curves meet in a tangent at the geometrical center.[2]



Centering is very important with this mode of lens design. The VE-ACC Translating lens incorporates prism and truncation. Also superior decentration of distance zones optical center and of the segment have been used to achieve maximum clarity when the lens interacts with the lids.[2] Variations of base curve and diameter are necessary to achieve proper centration of the lens. This lens should fit on alignment with 1.0mm movement upon blinking, and 2.0mm of translation upon downward gaze. The bifocal segment should be about 1.3mm below the visual axis or 0.4-0.7mm below the pupil margin.[3] Soft alternating lenses are

limited to two or three base curves and diameters, as well as add powers. This will limit presbyopic candidates from benefiting from a soft lens choice. A soft material limits the changes that can be done because only a few parameters are made in each design. If modifications are needed, an RGP material will be much easier to modify. Alternating designs for RGP allow for more specificity in base curves, diameter, add power, prism ballast, truncation and segment types.

In order to be successful in fitting, it is important to be able to control aspects such as curvature, lens movement, rotation and shift. For example, if distance vision is blurry, consider that the lens may be resting too high or excessive rotation has occurred. If the segment is too high consider a flatter lens. A steeper lens will correct a lens that has rotated too much. Near blur can be caused by the same problems that cause distance blur. Consider that the lens has insufficient translation. Prism increase, in-office truncation modifications, or decreased overall diameter will remedy this. The most comfortable truncation has been shown not to be an anterior or posterior taper, but a flat edge.[1]

Simultaneous Lens

In simultaneous vision lenses, both the distance and near images are focused on the retina. The patient must selectively attend to one of the images, while suppressing the other image. There are three types of simultaneous vision lens designs: aspheric, concentric zone, and diffractive constructions. Unlike the translating types, in which one must look into a certain area of the lens to focus different targets, the simutaneous lens provides a clear image in any direction of gaze.

During the initial adaptation period, the patient may be confused by the retinal blur that is created from the presence of both near and far images on the retina. However, with time a process of "selective perception" will develop. Here the brain selectively attends to the clearer image, and can suppress the blurry images. This is known as "selective perception" and "selective suppression." [4]

Another factor with simutaneous vision is retinal illuminance. For an image to be clear, a certain amount of light must pass through the pupil to be focused on the retina. Retinal

illuminance is dependent on the amount of light that gets in. This is most apparent with the concentric design. Ideally, distance and near targets focused on the retina should receive 50% of the illuminance each. When reading, the pupil constricts, cutting down the amount of light that passes through the lens.[5] This creates a concern of clarity when pupil sizes are small. Careful measurements of pupil size and changes in size for different illuminations will help decide what far and what near zone size will be more beneficial. If there is decentering of the lens there can be poor image quality, image jump and ghosting effects. With this lens design the lens must remain centered on the cornea or a degradation of the focused image will occur due to not looking through a central point of the lens.[4]

An aspheric lens is one which has a gradual power change from center to edge. The lens can be of a center distance or center near design. The posterior surface is usually aspheric in a center distance lens, while the anterior surface is aspheric in a center near lens. The rate in which the lens flattens determines the bifocal add power. Since an aspheric lens is essentially a multifocal lens and the add power is determined by the interaction of eccentricity values with the base curve, there is no relationship between the spectacle add and the add in contact lenses required for near vision. [6] (See figure). A drawback of this lens is the image

degradation upon decentration of the lens. With a decentration of greater than 1.5mm, degeneration of the image will occur.[7] As the lens moves off to the side, the eye is focusing through an off-center point and thus there is a difference in power. Another phenomenon is the decreased Stiles-Crawford effect due to a decrease in the number of cones stimulated from off central viewing.[4] This will result in decreased clarity of vision through the lens.

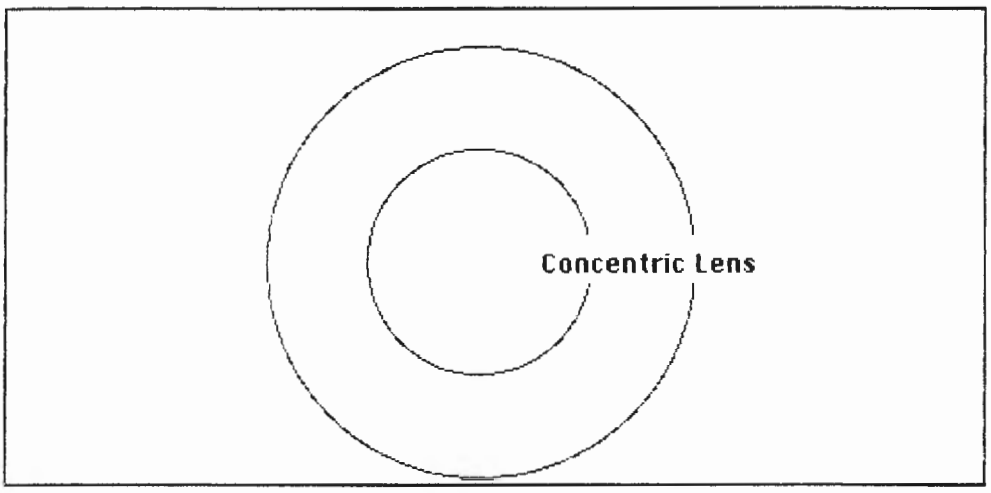
A simutaneous lens can be designed two ways. One can be with center distance or one with center near. The center distance design with an aspheric lens has been labeled a progressive lens type. This center distance type is also the design most often employed.

The aspheric lenses can be easy to fit. Two variabilities can alter the fit. First the pupil must be large enough to allow the peripheral lens power to be utilized. Optical quality and focus ability are very sensitive to changes in aperture size of the pupil. Consider most reading is done in good illumination, therefore the pupil size will decrease. Second, the rate of add power progression varies with lens asphericity. Manufacturers will only state nominal add, that assumes a certain pupillary diameter.

Depending on movement and lens asphericity, that will dictate the add achievable with this lens. Due to the aspheric shape of the back surface, RGP lenses must be ordered with a base curve that is much steeper than required for spherical lenses. Sometimes even 4-5 diopters steeper than k to achieve an alignment fit. [8] Establish good centration and distance vision, then determine if sufficient add is present while the patient holds their eyes and head in normal reading posture. Manipulation of base curves and diameters may be necessary to resolve add power problems. Adequate movement can allow reading to occur through the peripheral areas of the contact lens. Diagnostic fitting is essential for success with this lens type.

There are many aspheric lenses on the market in both soft and RGP materials. These lenses are available in both front or back aspehric designs. This creates either the center near or center distance lens. The PS-45 from Ideal Optics was one of the first on the market, this being a front aspheric lens. Other front aspherics are made by Preferred Optics, the Multivue 53 lens, and Unilens by Unilens. Some of the back aspheric designs include Allvue (Salvatori), Fulfocus (CL Corp. of America), Hydrocurve II (PBH), PA-I (B&L), V/X (GBF). For the RGP designs, refer to the table.

Concentric design is the second simutaneous lens type. This is a design in which either a center distance or center near power is surrounded by the opposite lens power in the periphery. See figure below:



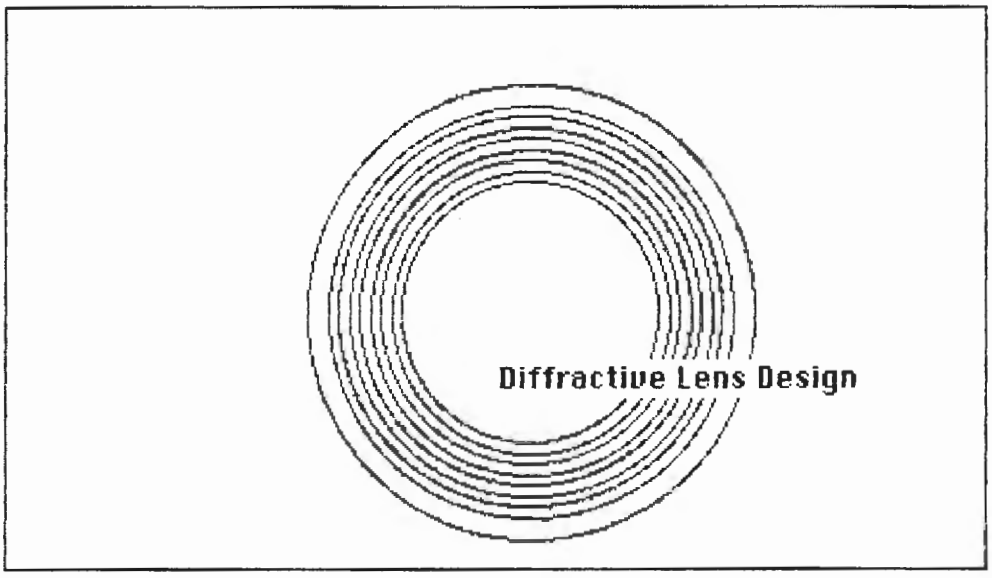
In a center distance lens,` the annular peripheral ring would be the appropriate add power. Optical performance of the concentric designs are highly sensitive to variations in pupil size. The best visual performance occurs when 50% of the entrance pupil is covered by each zone.[4]

Center near lens design will maximize close work, such as for reading. When looking at distance targets the pupil dilates,

therefore, the annular peripheral ring will maximize far clarity. For center distance, maximal distance vision can be achieved by the normal pupillary constriction during daylight hours. A chief disadvantage of this is that under these same bright conditions, the pupil constriction limits the amount of light that can pass through the peripheral near add portion. To increase near image clarity, two equal central lens zone diameters should be used rather than unequal central lens diameters.[9] The extent of the distance or near vision compromised depends on lens designs and features. Diagnostic lenses must be used because centration and size of optic zones are essential for a successful fit.

The diffractive bifocal lens design uses concentric, annular, narrow rings of equal area eschelets, as they are called, each with a specific refractive power, to construct the image.[4] The number and proximity of these annular diffractive zones determine the add power. Each annular region introduces half a wave shift between the adjacent eschelets; thus introducing destructive interference and making it easier to suppress the out of focus images. The diffractive design eliminates intermediate points of focus, and attempts to give equal intensity illumination to both distance and near points. This type of lens has the potential to provide best resolution because it uses the entire aperture to focus light. Unlike other simultaneous bifocals, concentric and aspheric, the blur

circle will be dim, and diffuse. The quality of the image formed is less dependent on pupil size, allowing for complete image focusing in low and high illumination tasks. [2,4] Since the diffractive lens still involves pupil sharing, the quality of the image is still dependent on light intensity. In low illumination, some reduction in contrast occurs and requires a need for more illumination for near.[10] Proper positioning of this lens type is very important, because lens decentration will induce glare or ghost images. Due to current limitations in lens parameters, available diffractive lenses are less successful for early presbyopes, who have not yet adapted to the progressive degradation of uncorrected vision due to presbyopia.



Currently two contact lenses use this type of design. These are the Diffrax bifocal, a rigid gas permeable lens by Pilkington/Barnes-Hind, and the Hydron Echelon bifocal, a soft daily wear contact lens by Allergan. The Diffrax bifocal lens, which is not yet approved, is reported to provide good visual acuity at both distance and near.[11] Also, being non prism-ballasted, the diagnostic fit is relatively similar to that of a spherical lens. In this lens, the diffractive zone is extremely thin and does not trap debris in the junctions. A steep fitting technique is recommended and the low DK RGP lens material used makes corneal edema a possible lens induced complication.

The Hydron Echelon bifocal lens has the benefits of the Diffrax, but being a soft lens it is considerably more comfortable and requires less adaptation. This lens, however, does not perform well in conditions of low illumination and low contrast such as driving at night, or low light, close up near tasks.[12] Relative performance success rates will be reviewed later in this paper.

Soft Bifocal Contact Lenses

DESIGN	Trade Name	Company	% Water/dK	Diameters	Base Curves	Powers	Adds	Optical Zone
Alternating:								
Translating Pen Ballast	Bi-Tech	B&L	38%/8.4	14.5	8.7, 9.0	P: -6 to +6	A:+2.00, +2.50	
Simutaneous:								
Concentric Center Near	Alges Bifocal	Unilens	45%/11.3	14	8.6,8.9	P: -6 to +6	A:+1.50 to +3.50	8.5
	Simulvue	Unilens	45%/11.3	14.5	8.7, 9.0	P: -8 to +6	A:+2.00,+2.50, +3.00	9.0 Dx/2.3 Nr
	Spectrum	Ciba	55%/16.0	14	8.6, 8.9	P: -6 to +6	A:+1.50 to +3.50	
Concetric Center Distance	Bi-Soft	Ciba	37.5%/8.0	13.8	8.3,8.6,8.9(+)	P: -6 to +6	A:+1.50 to +3.50	2.3/7.0
Diffraction	Echelon	Ocular Sc./A.H.	38%/8.4	13.8	8.7	P: -6 to +4	A:+1.50, +2.00, +2.50	8.7 to 6.4
Back Aspheric	Alvue	Salvatori	38%/8.4	14	8.5, 8.7, 8.9	P: -6 to +4	A:Prog. to +3.00	
	Fulfocus	CI Corp Of Amer.	38%/8.4	14.2	8.4, 8.7, 9.0	P: -12.50 to +4	A:Prog. to +3.00	
	Hydrocurve II	PBH	45%/12.0	14.8	9	P: -6 to +4	A: Prog to +2.50	4
	RA-I	B&L	38%/8.4	13.5	8.6	P: -6 to +6	A:+1.50	9.0, 7.0(>+2.25)
	V/X	GBF	38%/8.4	14.0, 14.3	8.2, 8.6	P: -20 to +20	A: to +3.00	
Front Aspheric	Multivue 53	Preferred Optics	53%/8.2	14.5	8.6	P: -6 to +6	A: Prog to +2.50	
	PS 45	Ideal Optics	38%	14	8.7	P: -3 to +6	A:+2.00	
	Unilens	Unilens	45%/11.3	14.0, 14.5	8.4, 8.7, 9.0, 9.3	P: -8 to +6	A:+2.25	9

RGP Bifocal Contact Lenses

DESIGN	Trade Name	Company	Type	Specific	Material	dK	Color
Alternating	Acc Translating	Salvatori	Translating	Annular Concave	Flouro-Siloxane Acrylate	18-90	4 colors
	Novafocal	Ocutec	Translating	Truncated	Strysilicone	55	blue
	One Piece Cresent	Salvatori	Translating	Front surface	Flouro-Siloxane Acrylate	18-90	4 colors
	Solitairelens	Tru-form Optics	Translating		Flouroperm or Equalens	30-90	many
	Tangent Streak	Fused Contacts	Translating			30,50,70	
		Polymer Tec.	Translating		Flourosilicone Acrylate	45	blue
Simutaneapus	Multisite	Salvatori	Aspheric	Concave	Flouro-Siloxane Acrylate	18-90	many
	ConstaVU	Salvatori	Aspheric	Front	Flouro-Siloxane Acrylate	18-90	many
	Alges Boston	Unilens	Concentric	Center near	Silicone Acrylate	14, 26	blue
	DURA-SIL	Danker Labs	Aspheric	Back Surface	Sil/Acrylate Polymer	18, 43	cl, bl, grn
	Metro Progressive	Metro Optics	Aspheric	Back Surface	Flouro-Siloxane Acrylate	32, 42	blue
	Novalens Percep.	Ocutec	Aspheric	Back Surface	Strysilicone	55	blue
	RUSS-SIL	Russ Labs	Aspheric	Back Surface	Sil/Acryl or Flourocarbon	18, 43	cl, bl, grn
	Unilens RGP	Unilens	Aspheric	Back Surface	Flouro-Siloxane Acrylate	30	blue
	VFL II	Conforma	Aspheric	Back Surface	Flouro-Siloxane Acrylate	18-90	blue
	VFL 3	Conforma	Aspheric	Back Surface	Flouro-Siloxane Acrylate	30	blue
	V/X	GBF	Aspheric	Back Surface	Flouro-Siloxane Acrylate	18-90	many

FITTING GUIDE FOR BIFOCAL CONTACT LENSES:

Pre-fitting Examination:

Considerations:

-Patient motivation and visual demands.

-Is the patient suitable for contact lens wear? From case history, biomicroscopy, and refraction, what type of lenses would best suit their needs.

Collect baseline data:

-Take initial measurements: Keratometry, HVID. tear assessment, ophthalmoscopy, tonometry, lid disease or abnormality assessed.

-Find spherocylinder refraction for distance for post fitting comparisons. Compensate for vertex distance if greater than +/-4.00D.

-Determine appropppriate near add.

Choosing a Lens:

The practitioner must be aware of different lens types and have numerous diagnostic lenses on hand. The first lens chosen is the result of personal experience and knowledge with each lens. Experts will agree that an RGP may be a good initial lens. **Alternating** lenses work well for patients with high add requirements, reduced monocular acuity, reduced contrast sensitivity or when stereopsis is important. For **simutaneous** lens designs, consider an **aspheric** or **concentric** when the patient requires a low add or has a large pupil. **Diffractive** designs work well when the patient needs a moderate add and is tolerant to contrast loss. Start with a translating lens type and go from there. If a person spends alot of time at a VDT, then maybe an aspheric simutaneous view will better suit their intermediate needs. Use some logic between patient needs and use, then consider design.

- Material: Soft vs. RGP.

Consider the patient. Are you fitting for full time use or part time wear What are the visual needs, excessive near or far work. What medications are

taken, what are the anticipated ocular changes. If lids lack elasticity an RGP translating lens will not be a good choice.

- *Base curve/ Radius:*

Most soft lenses should be fit with the same methods as spherical lenses. With simutaneous vision, if the patient doesn't have good initial reaction try another lens design. RGP lenses follow typical fitting methods. For segmented lenses, start out with "on K" fits and adjust accordingly. Expect 1-1.5mm movement when eye is in primary gaze. A **translating** lens should have the segment about 1.3mm below the visual axis and translate upward about 2mm upon downward gaze. A **diffractive** RGP such as the Diffrax (PBH) should be fit .10mm steeper than the flattest K, or .2mm on a cornea with high toricity. As for an **aspheric** lens, they are fit steep, even up to 4-5 diopters steep to achieve alignment..

- *Powers:*

Use examination results for best visual acuity and near add power.

Initial lens evaluation:

-After allowing the lens to properly settle on the eye for a period of time. Check lens centration and movement. After each blink, a soft lens should move 0.5-1.0mm in primary gaze, and at least 1.0mm in upward gaze. An RGP should move 1.0mm and have good snap-back.

- Use the biomicroscope to find lens placement of the near add. For example: the ring eschlets will be visable with retro image; segment lines or peripheral edge markings can be seen in nornal white light. A translating segment height can be altered if necessary. Consider a dental mirror to observe translation upon downward gaze.

- Refraction over the lens. This should be a spherical and sphero-cyl refraction. Most accurate would be a contrast sensitivity chart at 20ft. and loose lenses. A proper lens power for distance can be estimated from this finding. Check the near visual acuity and change power based on this if necessary.

- A minimum of 20/30 BVA should be reached. Remember VA may improve upon adaptation.

- Alternative lens selections: To improve the fit, change one parameter at a time and observe the effect, or change the lens design altogether.

Dispensing:

- The clinical check: Do a complete evaluation of the lens on the eye. Make sure all functional aspects look good. Check centration, movement, over refraction both near and far.

- Patient education is critical for contact lens success. Make sure they understand all aspects of care, use, and adaptation. Take time to explain how the lens design works and what they can expect. Successful adaptation can be made easier if they are knowledgable and understand how to utilize the optics of their lenses.

- Allow an adaptation period for new lenses. A soft lens should be within one week. RGP's will take a little longer due to lens awareness.

- Check visual acuity. Subjective blurring of vision is normal, even with good acuity.

- Halos around lights or glare in low illumination may be reported initially.

Follow-up:

Scheduled follow-up care:

-One week after dispensing, one month, three months, and every six months thereafter.

-Record any patient symptoms related to contact lens wear. Examine lids and conjunctiva. Check visual acuity and do an over lens refraction. In the slit lamp, verify that the lens still meets all criteria of a well-fitting lens and examine the lens for surface deposits, and/ or damage. Have patient remove the lens and evaluate the cornea with and without Sodium Flourescein. Perform keratometry and compare to initial values. Be aware of any changes in findings.

COMPLICATIONS

In fitting any modality of contact lenses, there are many complications that can interplay. A careful practitioner will listen closely to the patients and decide which lens will best suit their needs. Bifocal contact lenses bring a new set of complications not often encountered in other contact lens patients.

Communication and patient understanding is quite often the most common complication. As stated earlier, how well you understand your patients and they understand you can almost dictate your success. If the patient is fully educated at the start, motivation will generally increase to enable team work through some of the fitting obstacles. The patient needs to have a realistic understanding of the advantages and limitations of bifocal contact lens designs. Talk things through before they get out of control. Make sure every patient concern has been addressed and resolved. Communication is crucial and must be a priority.

Cost can be a deterent for many, but it doesn't have to be. Many practioners have been reluctant to try bifocal contact lenses, because of cost to the doctor and the patient. The lenses are expensive and fitting requires more of the doctors time. When billing with insurance, the extra expenses above conventional

fittings will often transfer directly to the patient. Many insurance groups have a set flat fee they will cover for contact lens reinbursements, the additional charges are billed directly to patients. Therefore, patient education is vital, it is imperative that they understand why there are greater initial costs, and why there will be more office visits and expense for lens replacements. Be upfront about costs, but justify them. Let patients hear about the success rates, and also the refund policy should they be unsuccessful. There will be some visual compromise with all modalities, so talk about lens designs. At dispensing, patients must understand how their lenses work to maximize their vision. As their visual requirements change, so might their contact lens needs. Bottom line, make the patient feel comfortable with their lenses and let them know you will be there to help make the transition as easy as possible.

Presbyopic patients present more often with systemic and ocular health conditions, vascular changes, and thus pharmocological interactions. They are likely to be taking systemic drugs as a regular regimine. Some of the commonly prescribed drugs have occular side effects. Many types of these drugs may include antihistamines, anticholinergics, antiarthritic, hormones, antidepressants and salicylic acids. A common thread with many of these is the prevelence of their effects on tear volume. Often

they decrease normal tear production. There is a decreased tear production due to normal physiological changes. Other complications with systemic drugs include blurry vision, halos, glare, anisocoria, nonspecific conjunctivitis and blepharitis.[13] Discomfort in lens wear can result from these side effects and the dry eye symptoms associated with age. Another contact lens finding due to age is the increase in lens deposits and general irritation.

Drug induced side effects can mimick contact lens complications. What can you do about them? Check first the obvious contact lens induced problems of fitting, oxygen permeability, contact lens wettability and chemical usage to name a few. Once eliminated, consider ocular side effects of any medications or combination of drugs. There are many sources to find these. Fit these patients as you would a dry eye patient. Use lenses with better wetability, higher Dk, and lenses that resist deposits better. Consider an RGP material to solve your problems.

Centering can be a problem due to changes in the eylids and apposition. Loss of mucle tonicity and excessively lid flacidity create trouble when using lenses such as prism ballasted lenses that require lids to help aid lens position. Prism ballasted lenses are fit to be held in place by the lower lid for proper positioning. With a loose lid the contact lens may not be held as steady. A

truncated lens can aid this by exaggerating the prism base edge.[14] Experts agree this lens is often difficult to modify. If translation does not occur easily at the fitting, abandon this design. After a few weeks in wear the translation has been known to change to make the tranlation more difficult.[15]

If your patient is in an RGP material, removal may be difficult by the corner "tension-snap" tecnique. Due to lid changes, an easier method for removal would be to place a finger from each hand just at the edges of the lid and position them on top and bottom of the lens. Firmly press against the globe drawing the lids under the edges of the lens, and remove it. This manual method of removal works well with loose lids.

The lenses are on, they fit well, can the patient see? That is the next challenge with bifocal contact lenses. Most experts will agree the best tecnique to check vision is with the use of trial lenses rather than the phoropter. For normal reading or distance viewing, this method will allow the patient's eyes to point in normal viewing directions instead of an artificial setting produced in an instrument. Proper lid interaction can be achieved. Many bifocals such as the translating or progressives require this interaction upon downward gaze to pull the lens upward. Pupil diameter can also be controlled by lighting. If done properly, this provides a

natural, comfortable setting for the patient in which assessments can be made easily.

SPECIAL FITTING APPLICATIONS

In addition to satisfying the presbyope's need for clear vision at both far and near, bifocal contact lenses have been used in a variety of special fitting applications. These special fitting applications apply to sport vision, occupational vision, strabismus treatment, and treatment of monocular aphakes.

Contact lenses have offered the world of sports many benefits. A few of these include comfort regardless of weather or environment, convenience, freedom from spectacles, constant corrected vision in all directions of gaze, unobstructed field of view, and undisturbed peripheral vision. Presbyopes should be allowed to take advantage of these benefits. The presbyopic golfer is a good example. This athlete should be educated about the possible enhancement of vision as well as visual and task performance offered by an appropriate correction.[16] The golfer spends a lot of money on equipment, lessons, green fees, videos and anything that may improve the game. Through the use of contact lenses, enhanced visual judgment of the distance to the flag, the roll of the green, and alignment of the ball with the cup,

especially for "a-hole-in-one", will enhance the golfer's performance .

The patient's occupation must be considered when fitting bifocal contacts lenses. For example, what type of bifocal contact lens are you going to fit a person who spends a lot of their time at a computer? Some lenses will work better than others. Think in terms of what types of ophthalmic lenses will inhibit or enhance vision. A typical flat top bifocal spectacles will not serve a patient well. There will be a constant shuffling above and below the line to find a clear area, and often the segment line will bisect the working area. To avoid this, a progressive type bifocal would better suit their needs. So transfer that idea to contact lenses. Consider lenses that have an add power that progressively changes. Such a lens has a variance of power from the distance prescription to the near add. The VDT operator can now view the clock across the room, a customer sitting on the other side of the desk, the computer screen and the hard copy lying on the desk. A poor choice of lens would be the translating lens due to the abrupt power change and image jump. Another VDT consideration is the blink response. Many studies have shown that when a person works on a computer, the blink rate decreases. Because of this, the contact lenses need to have good wettability and comfort. Fit lenses as you would a dry eye patient. A history of excessive

tearing and discomfort resulting from dry eyes must be explored thouroughly. These conditions should be considered when fitting the patient.

Bifocal spectacles have been used as an accepted form of treatment of accommodative esotropia with high accommodative convergence/ accommodation ratio (AC/A).[18] With the advent of contact lenses, it seems only logical that they be used also to achieve relief from such a functional deviation. Bifocal contact lenses, in particular the Tangent Streak, are an option in the treatment of accommodative esotropia with high AC/A.[19] In the distance and at near, motility with the Tangent streak is equal or slightly less than with bifocal spectacles, but is much better than without correction. Visual acuity is maintained at 20/20 in the distance and J1 at near. Stereo acuity is equal to or is much better than with bifocal spectacles. In cases of intermittent esotropia for distance and constant esotropia above the bifocal at near, binocular fixation can be maintained for both distances through bifocal contact lenses. A 70% success rate for fitting has been achieved with the Tangent Streak bifocal contact lenses.[20] Other forms of treatments for accommodative esotropia exist, are acceptable and have certain limitations. They include the use of miotics, extra-ocular surgery, orthoptic and single vision

lenses.[20-25] Bifocal contact lenses offers an alternative form of treatment.

A high success rate of 74-94% has been observed using single vision contact lenses in the management of monocular aphakia. An advantage contact lenses have over spectacle correction is the reduction of anisometropia. Also, the use of contact lenses was found to improve peripheral vision, preserve binocular vision, and enhance cosmesis. An additional benefit of managing monocular aphakia with bifocal contact lenses is the compensation of non-accommodative vision.[26] In research done by Conklin et. al, four different bifocal RGP contact lenses (ACC, TS, VFL and Constavu) were used to correct presbyopic symptoms of six young monocular aphakic patients.[27] Subjective estimation of comfort and vision were used to compare effectiveness of the contact lenses with the normal emmetropic accommodating fellow eye. Each of the four lenses studied provided comfortable and satisfactory vision at distance and near in the majority of the patients. The range of acceptance varies from 50-100%, and is consistent with previously reported rates of fitting success in presbyopes with the ACC (67%), VFL (74%) and TS (60-93%).[28,29] No lens had a definite advantage over the others; however, the aspheric front design of the Constavu lens was subjectively more effective for both distance and near vision.

Problems encountered resulting in unsuccessful performance include blurring of images far and near, haloes, glare, diplopia, discomfort and image ghosting.[28-31] Although problems exist and success rates are variable, if the lenses are well fitted and the patients adapt successfully, then bifocal contact lenses are a viable option in visual rehabilitation of the monocular aphakic.

CONCLUSION

The contact lens industry is changing to meet the demand for bifocal contact lenses. Many options are available to presbyopic patients. The practitioner needs to gain knowledge about the lenses to start fitting. Fitting presbyopes can offer the practitioner a challenging yet rewarding specialty contact lens services. This paper was written to provide an overview on available bifocal contact lens types, and a fitting guide that can be used to help practioners get started in fitting bifocal lenses. Success rates vary from 50-93%, this large range is due to different experimental criteria and sample populations. Success in fitting will follow as the practitioner becomes more experienced, and experience will only be gained through fitting more bifocal contact lenses.

Bifocal contact lenses are not the answer for every presbyope, or even every presbyopic contact lens wearer. They do, however give the practitioner some alternatives to choose from. At first glance, the fitting modalities appear complex. With a clear understanding of options available and patience, fitting bifocal contact lenses will not seem so arduous. The fitting guide can be a valuable tool to use. The complications section and

special fitting applications section will aid in the not so ordinary problems.

Alternating bifocal contact lenses are similar to the conventional ophthalmic eyewear lenses. For distance vision, one needs only look straight forward in primary gaze. For reading or other near tasks, the eyes normally look downward allowing the translation of a bifocal segment due to lid interaction. Simutaneous lenses provide a clear view of both distance and near objects. There are many types that can achieve this goal. Diffractive, aspheric, and concentric designs are the ones discussed in this paper. Different choices can be made because of pupil size, refractive errors, and the add requirement. To choose the lens that is right for your patient, consider each aspect carefully, and decide which lenses can meet these demands.

Growth of a contact lens practice has a lot to do with flexibiiity and creative thinking. Continued effort will provide the practitioner with substantial benefits that will carry over to the patient.

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