An Investigation of Vision Quality and Fitting Aspects of the Boston MultiVision Rigid Gas Permeable Lens

OPTOM 797

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ABSTRACT

The Purpose of this study is to become familiar with the fitting modalities of the Boston Multivision Rigid Gas Permeable (RGP) contact lens. We are interested in the objective visual acuity measured via Snellen charts, and contrast sensitivity function at distance and near. In addition, patients will complete a questionnaire as a means of evaluating the subjective visual performance of this lens.

INTRODUCTION

This research evaluates three parameters involved with fitting Boston MultiVision Rigid Gas Permeable (RGP) contact lens. First, the quality of visual acuity obtained using this multifocal RGP was objectively evaluated via both Snellen visual acuity charts, and the Vistech contrast sensitivity function charts. Acuities were measured using appropriate distance or near charts. Secondly, in a qualitative analysis, using a questionnaire format, subjects were asked to evaluate the visual performance of this multifocal RGP lens based on their individual experience. Finally, an increased level of knowledge and overall familiarity in fitting multifocal RGP's was reached through the process of multiple fittings in this study.

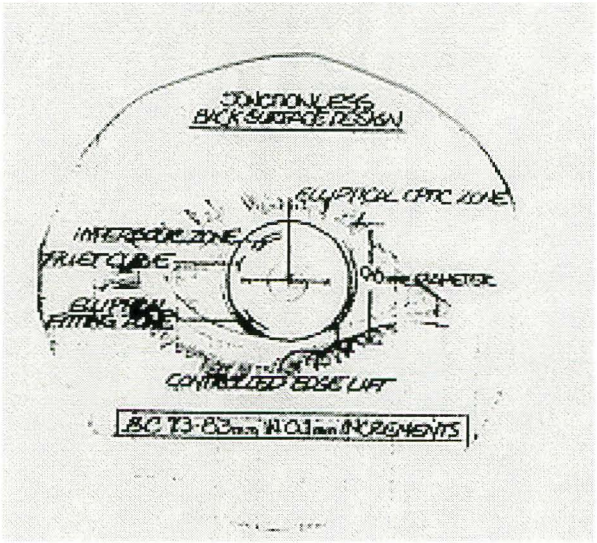
MATERIALS

Materials required for this study are listed as follows. Boston MultiVision RGP trial contact lens fitting set, Snellen Visual Acuity charts for distance and near, and the

Vistech Contrast Sensitivity charts for distance and near. In addition, a phoropter, spectacle trial lens frame with a variety of loose lenses, cover paddle, lensometer, and keratometer were also required. Subjects for this study were ten early to middle presbyopes. Each eye was evaluated under monocular conditions. (n=20 eyes)

The Boston MultiVision RGP fitting set consists of eleven lenses with a 9.6mm diameter, 7.3-8.3mm base curves, in .1mm increments, at a power of –3.00D, and a nominal add power up to +1.50. The design of this aspheric contact lens can be seen in Figure 1.

FIGURE 1. ***Lens Design*** ***Adapted from Boston™ MultiVision Fitting Tips*** ***8-8-97***



METHODS

The criteria of this study required selected subjects to have a presbyopic correction. Prior to contact lens selection and application, entering visual acuities were measured with the subjects' habitual correction using the Snellen visual acuity charts and

Vistech contrast sensitivity charts for both distance and near. The Vistech chart uses five gradations of the sine function ordered from low to high contrast, presented vertically, or rotated approximately thirty degrees to either the right or left. The subject is then required to guess the alignment of the grating. The first missed guess indicates the limit of their contrast sensitivity resolution. Refer to Figure 2 for a diagrammatic representation of the sine function gratings similar to those utilized by the Vistech contrast sensitivity chart.

Keratometry was performed, and lenses were selected based on 0.1mm steeper than the flattest K reading principle suggested by the manufacturer. Once the proper base curve was determined, the lens was applied to the eye and allowed to stabilize until the patient stopped tearing excessively. This ranged anywhere from 0-5 minutes. Subjects who had previously worn RGP lenses stopped tearing much more quickly than subjects who had not worn them. An over-refraction was then performed to neutralize the residual refractive error. The residual refractive error was corrected with trial spectacle lenses. Visual acuity and contrast sensitivity measurements were recorded in the same manner as with the patients' habitual correction. Upon conclusion of the trial fitting and acuity measurements, the subject was then asked a series of questions regarding physical comfort, visual comfort, and based on this experience, if they felt this lens would be an acceptable method of correction for their presbyopic refractive error. Refer to Table 1 for the questionnaire.

FIGURE 2 ***Diagrammatic Representation of Sine Function Gratings similar to those utilized by the Vistech Contrast Sensitivity Chart.***

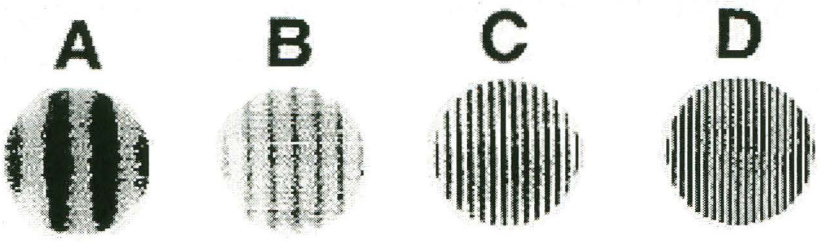


TABLE 1 ***Questionnaire***

SUBJECTIVE QUESTIONAIRE about BOSTON MULTIVISION RGP's

1. Did you feel your near vision was adequate with the contact lenses?
2. Did you feel your distance vision was adequate with the contact lenses?
3. Is the vision with the contact lenses better of worse than your current prescription? Why?
4. Would you be willing to pay more for these contact lenses if you have proper distance and near vision if you were considering wearing contacts?
5. Does the near portion of the contact lens interfere with your distant vision significantly?
6. Does the distance portion of the contact lens interfere with your near vision significantly?

RESULTS & DISCUSSION

In this analysis, all 20 subjects had a best- corrected visual acuity (VA) of 20/20 or better at both distance and near with their habitual correction. Distance visual acuities measured using the Boston MuliVision RGP with the trial lens neutralization of residual refractive error was better than, or equal to 20/20. At near, 70% had VA's of 20/20 at near with the multifical contact lens. The remaining subjects measured near acuities rank as follows; 10% had 20/30 VA, 10% had 20/40 VA, 5% had 20/60 VA, and 5% had 20/80 VA. One possible explanation of the diminished near acuities could be due to the maximum add of +1.50D. The subject age range in this study was 40-55 years old and some of the older subjects were currently wearing an add power equal to or greater than +1.50D. A second possible explanation is incomplete translation of the lens to reach the full nominal add power. Translation of an RGP contact lens occurs when the lens decenters upwards while the patient views an object of regard in down gaze. Snellen visual acuities and subjects' data averages are located in Table 2.

Contrast sensitivity was measured at distance and near with both the subjects' habitual prescription and the Boston MultiVision RGP contact lens. Contrast sensitivity function is a tool to detect and measure optical, neurological, and pathological disorders. This research was designed to detect if the eccentric asphericity with simultaneous and alternating vision lens design negatively influenced the contrast sensitivity from the patients' habitual modality of correction. Figure 3 illustrates the normal range of contrast sensitivity located within the shaded area. All twenty subjects measured contrast sensitivity values placed within the normal range for their habitual and Boston

MultiVision RGP lens evaluation at distance and near. Therefore, we can conclude that the eccentric, aspheric, simultaneous, and alternating vision design of the Boston MultiVision RGP does not interfere with contrast sensitivity.

TABLE 2 ***Subject Data***

Subject Age

Range: 40-55 years old

Average: 46 years old

Subject Habitual Prescription

Sphere Range: plano- -8.50D

Average Sph: -2.62 D

Cylinder Range: 0.00D—2.00D

Average Cyl: -1.30D

Subject K Readings

Range: 41.00- 45.00D
Average: 43.28D

Subject Habitual Add Power

Range: Plano- +1.75D

Average: +.875D

Subject Trial Lens Base Curves

Range: 7.5mm-8.2mm

Average: 7.78mm

Subject Sphere Over- Refraction (OR)

Range: -6.00D- +1.75D

Average: -2.00D

Subject Habitual Snellen Acuities

Distance: 20/20

Near: 20/20

Subject Snellen Acuities, Lens with OR

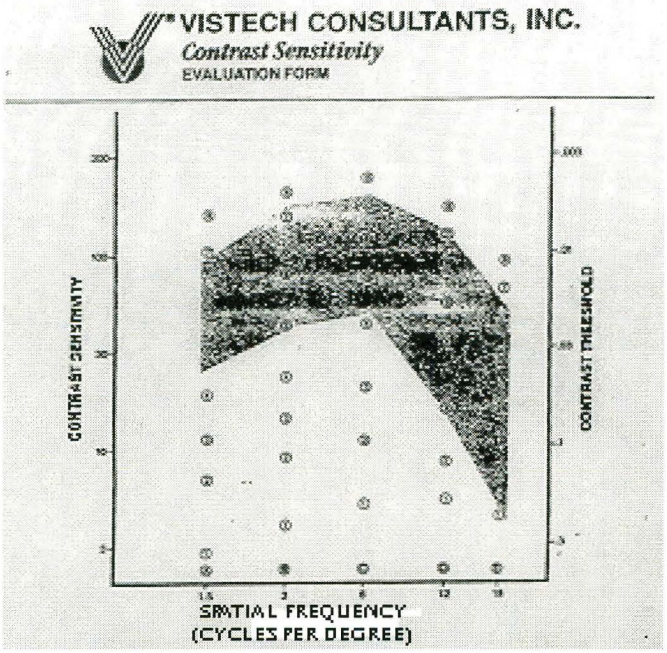
Distance: 20/20

Near: 14 eyes 20/20 2 eyes 20/30

2 eyes 20/40 1 eye 20/60

1 eye 20/80

FIGURE 3. ***Contrast Sensitivity Evaluation Form.***
Adapted from Vistech Consultants, Inc. 1986 ***Vistech form 00964***



If a contrast sensitivity loss had occurred, it would be necessary to look at the following to determine the visual function loss:

A) High frequency loss - mostly affects near point tasks involving fine detail.

B) Mid frequency loss - involved with tasks related to mobility.

C) Low frequency loss - tasks related to viewing large objects, such as buildings or people.

The second portion of this evaluation questioned the subjects in an attempt to gain a subjective qualitative evaluation of the performance of this multifocal RGP. Refer to table 2 for the questionnaire. All of the subjects were pleased with their distance vision. Of the subjects, 70% felt their near vision was functional with the contact lens. However, only 50% of the subjects seemed think their near vision was equal to their current glasses prescription. One possible reason the subjects did not believe the vision with this contact

lens trial was comparable to their habitual correction could because a spherical over-refraction was used instead of an exact powered contact lens. Of the subjects, only one complained of diminished near vision secondary to the distance correction of the lens. This subject was also a moderate presbyope and was wearing an add power of +1.75D. Despite seemingly mixed results, and assuming a success rate of 70% (subjects corrected to 20/20 at near), a full 90% were willing to pay more for these contact lenses if they were given their proper prescription.

The Boston MultiVision RGP is an aspheric designed contact lens that provides simultaneous and alternating vision. It achieves this by having central eccentricity with a mid-peripheral hyperbolic area that increases in plus power. In order to gain maximum plus power with this lens, it must translate in reading gaze. The lens is designed with the following regions:

A) Elliptical Optical Zone - provides distance vision

B) Hyperbolic Zone - provides plus power for a nominal add up to +1.50D

C) Fillet Curve - lathed region between the elliptical and hyperbolic zones

D) Elliptical Fitting Zone - controls edge lift

E) Controlled Edge Lift - similar throughout base curve range

It is also designed to give the patient greatest comfort via edge lift control for optimal edge clearance. This lens is a back surface aspheric lens, which is precisely manufactured using a lathe. The contact lens is made from Boston ES material, a fluoro-silicon-acrylate lens, which provides a Dk value of 31, enhanced wetting and deposit resistance to enhance visual acuity, and excellent durability to increase the length of the life of the contact lens.

An attractive feature of this lens is it has few fitting parameters which helps clinicians become more efficient with the lens to save on total "chair time." Clinicians are only required to know the patient's prescription power, K readings and base curve. Typically this lens is fit based on the flattest K reading, or 0.1mm (+0.50D) steeper. It also has better fitting and alignment if the patients' corneal toricity is less than 2.00D.

Since the lens has on overall 9.6mm diameter, it will provide full corneal coverage for most patients and also provide proper lens centration. The alignment fitting philosophy also helps to minimize chair time. Lens centration and adequate translation are important because both are required for patients to achieve simultaneous distance vision and with efficient alternating near vision.

In- office lens modifications are strongly discouraged. Attempts to decrease the overall lens diameter (OAD) may compromise the fitting characteristics of the lens. Decreasing the OAD will mainly decrease the nominal add power. Back surface modifications will damage the aspheric add power curves, and negatively alter power and fitting characteristics.

Lens decentration can be resolved via base curve modification by attempting a flatter or steeper base curve. A steeper lens should be selected if the lens decenters laterally or shows central bearing. If the lens shows mid-peripheral bearing or vertical decentration, the base curve should be flattened 0.1mm. It is also necessary to look at the upper and lower lid interaction with the lens to ensure proper centration when viewing at distance and proper translation if viewing at near.

This particular aspheric lens can provide an add power up to +1.50D. The Boston MultiVision RGP is an excellent choice of correction for early or emerging presbyopes

particularly if they are currently RGP lens wearers and require an add no greater than +1.50D. A clinician should not attempt to fit this lens on patients requiring an add greater than +1.50D, because the patient will most likely be unsatisfied with their near vision.

Overall, the Boston MultiVision RGP contact lens was well accepted by the emerging to early presbyopic subjects with a higher acceptance level demonstrated by previous RGP wearers. Clinicians considering a multifocal RGP should consider fitting emerging presbyopes with this lens until the patient reaches a near power of +1.50D. Clinicians should also keep in mind that this lens works best if it is fit on the flattest K reading or +0.50D steeper than the flattest K reading. The Boston MultiVision RGP provides the crisp vision of a traditional RGP lens, yet, it utilizes both simultaneous and alternating optics to provide optimal vision at all distances.

BIBLIOGRAPHY

Anderson, Chad, M.D., et al. *A Qualtitative and Quantitative Assessment of the NOVAWET-Perception Bifocal Contact Lens.* Contact Lens Association of Ophthalmology Journal. April, 1996. Vol. 2, No. 2, pp. 109-113.

Baude, Dominique, PhD, et al. *Simulated in Situ Optical Performance of Bifocal Contact Lenses.* Optometry and Vision Science. July, 1997. Vol. 74, No. 7, pp. 532-539.

Bergenske, Peter, O.D. *First Impressions of a New Disposable Bifocal.* Contact Lens Spectrum. September, 1998. Vol. 13, No. 9, pp. 39-42.

Bierly, John, M.D., et al. *A Quantitative and Qualitative Assessment of the Solitaire Bifocal Contact Lens.* Contact Lens Association of Ophthalmology Journal. January, 1995. Vol. 21, No. 1, pp. 20-23.

Bierly, John, M.D., et al. *Clinical Experience with the SimulVue Soft Bifocal Contact Lens.* Contact Lens Association of Ophthalmology Journal. April, 1995. Vol 21, No. 5, pp. 96-98.

Chateau, Nicolas, PhD., et al. *Infrared Pupillometry in Presbyopes Fitted with Soft Contact Lenses.* Optometry and Vision Science. October, 1996. Vol. 73, No. 12, pp. 733-741.

Classe, John, O.D. *Release of Contact Lens Prescriptions: An Update.* Journal of the American Optometric Association. February, 1997. Vol. 68, No. 2, pp.125-129.

Freeman, Paul, et al. *The Art and Practice of Low Vision.* Butterworth-Heineman. USA, 1997. pp. 40-42.

Fulga, Valentin, M.D., et al. *Clinical Assessment of Holo-or Trifocal Diffractive Contact Lens.* Contact Lens Association of Ophthalmology Journal. October, 1996. Vol. 22, No. 4, pp. 245-249.

Hansen, David, O.D. *Keeping RGP Bifocals On The Move.* Contact Lens Spectrum. July, 1998. Vol. 13, No.7, pp. 12.

Hansen, David, O.D. *What's New with RGP Bifocals.* Contact Lens Spectrum. January, 1998. Vol. 13, No. 1, pp.19.

Hutnick, Cindy, et al. *Multifocal Contact Lenses - Look Again!* Canada Journal of Ophthalmology. March, 1997. Vol. 32, No. 3, pp. 42-45.

McMahon, Timothy, O.D., et al. *Clinical Experience with a Multiaspheric RGP.* Contact Lens Spectrum. November, 1998. Vol. 13, No. 11, pp. 36-30.

Shaw, Roger, O.D., et al. *Multifocal Contact Lenses Today.* Contact Lens Spectrum. August 1997. Vol. 12, No. 8, pp. 21-25.

Wooley, Scott, O.D. *"Doctor, Do I Have To Give Up My Contact Lenses Just Because I Need Bifocals?"* Optometry Today. June, 1998, Vol. 6, No. 5, pp.40-42.