

RESIDUAL ASTIGMATISM AND VISUAL ACUITY THROUGH
SILCON AND PANFOCAL CONTACT LENSES

1985


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ABSTRACT

The purpose of this study is to determine the effect, if any, on visual acuity (both quantitatively and qualitatively) using Panofocal (anterior aspheric) and Silcon (spherical) contact lenses with patients possessing clinically significant amounts of residual astigmatism.

Keratometric (K) readings will be taken and a subjective refraction will be done. Then each eye will be fit with a rigid contact lens and an over-refraction will be performed to determine if the patients maintain at least 0.75 D of residual astigmatism.

Each eye possessing at least this much residual astigmatism will then be fit with two different lens types. The lenses will be fit on the flattest K reading.

After letting the patient settle into each lens for ten minutes, a quantitative determination of visual acuity will be performed using the psychometric visual acuity test and the contrast sensitivity function. Then the patient will be asked to look at a 20/20 snellen line of letters and qualitatively compare each lens.

The data will be collected and each lens will be graphically analyzed seperately and comparatively to determine which lens type, if any, is more useful in reducing the deleterious effects of residual astigmatism on the quantity and quality of vision.

Residual Astigmatism and Visual Acuity Through Silcon and Panofocal Contact Lenses

INTRCDUCTION

A problem (incountered) periodically in fitting rigid contact lenses is residual astigmatism or lenticular astigmatism. True residual astigmatism is present after corneal astigmatism has been (nutrilized) and can be considered to be present with (vertually) every contact lens wearer. Clinically significant residual astigmatism, amounts of -0.75 D cylinder or greater, has been estimated to be present in only 10% of contact lens wearers while other sources say the percentage is as high as 36%.

Many different types of contact lenses have been designed to correct astigmatism and residual astigmatism such as soft toric lenses, prism ballast front surface toric lenses, and bi-toric rigid lenses. It has been theorized that front surface aspheric rigid lenses also tend to increase acuity in patients with residual astigmatism. The objective of this clinical study is to compare the visual acuity of a patient with clinically significant residual astigmatism while wearing a spherical rigid contact lens (Silcon) to that while wearing a front surface aspheric rigid contact lens (Panofocal). The types of visual acuity measurements that will be compared include snellen, Psychometric series, and the very sensitive contrast sensitivity function. A subjective (responce) of the quality of vision will also be asked of the patient.

METHODS

The subjects participating in the study were required to possess at least -0.75 D of residual astigmatism in each eye. Initially, a subjective refraction was performed on each eye along with three keratometric readings. These three readings were averaged to give the amount of corneal cylinder present. The base curve of both lenses to be fit were determined by the flattest K reading. All parameters, diameter of 9.5 mm and power of -3.00 D, were consistent between the two types of lenses. A Silcon lens was fit on one eye while a Panofocal lens was fit on the other. After the lenses had settled for ten minutes, a subjective over-refraction was performed on each eye. This determined the amount of residual astigmatism present. A spherical equivalent was then trial framed for the testing. A complete psychometric visual acuity series was performed on each eye with the trial lens in place. Following this, a contrast sensitivity was run on each eye using seven different spatial frequencies. Three separate readings, testing from non-seeing to seeing, were taken at each frequency and the mean was recorded. After this, the patient was asked to subjectively grade the quality of vision in each eye separately. At this point the lenses were removed and the tests were repeated using the opposite type of lenses on each eye.

RESULTS

All four separate methods of comparing the quality or quantity of vision between the spherical rigid Silcon contact lens and the

front surface aspheric rigid Panofocal contact lens while a clinically significant amount of residual astigmatism is present showed an improvement in vision while wearing the Panofocal lens. Figures 1a-1d are contrast sensitivity functions of the two lenses superimposed on each other. This allows for easy evaluation of the increase in sensitivity in which the Panofocal lens provides over the Silcon lens. Snellen acuity, figures 2a-2d, and psychometric acuity comparisons, figures 3a-3d, provide a more practical evaluation between the two types of lenses. Subjective grading of the quality of vision between the two lenses was better with the Panofocal lens in three of four cases with the fourth case not noticing any difference between the two lenses.

COMMENTS

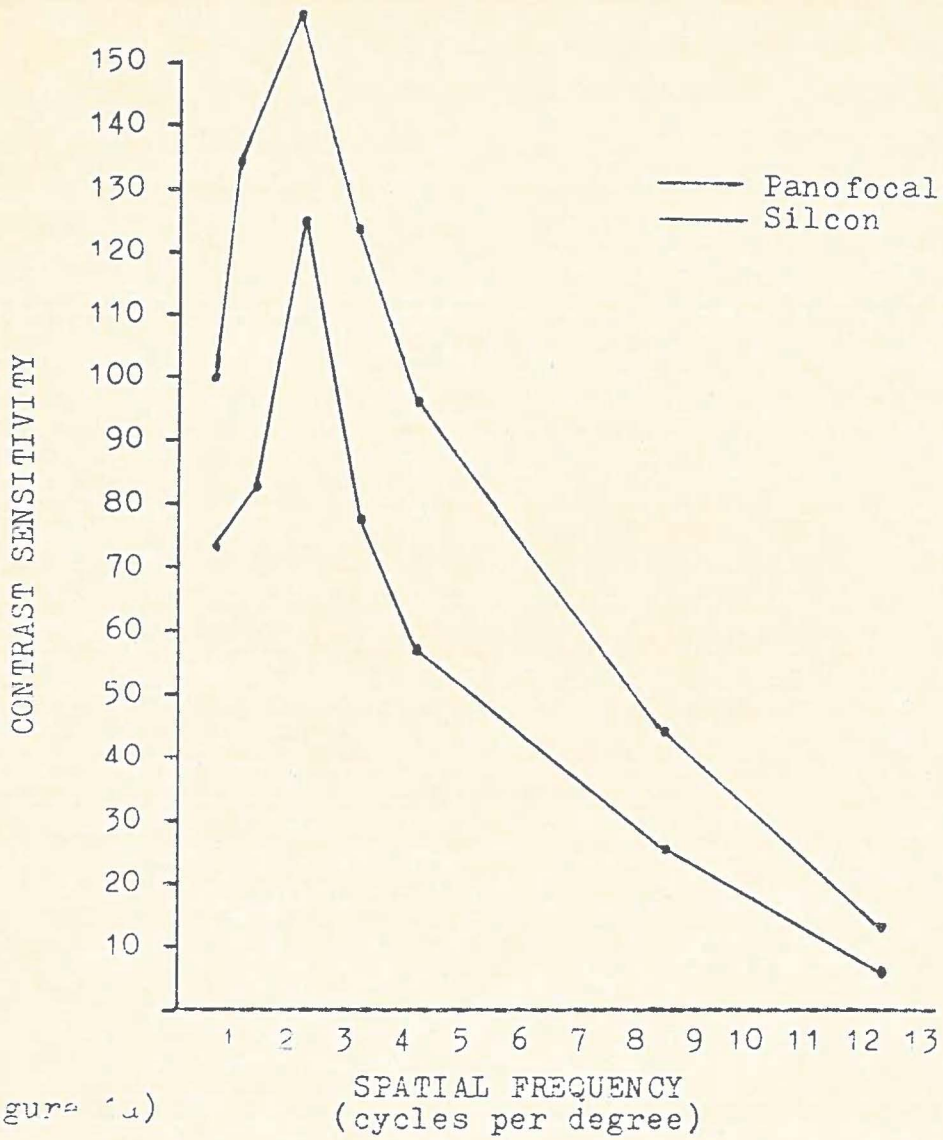
Since over-K's were not performed in this study, some of the over-refractive cylindrical correction may not have been actual residual astigmatism, but astigmatism due to flexure of the contact lens. Also, because these lenses were fit directly on the flattest K reading, lens flexure was probably present on the higher toric corneas. However, because both lenses were fit the same way, it was concluded that lens flexure remained constant and thus did not affect the results of the study.

The psychometric visual acuity slides which were used were not of the best quality. This is believed to have produced the slight variation between the snellen visual acuity readings and the psychometric visual acuity readings. This variation had no influence on the results of the study because what was being

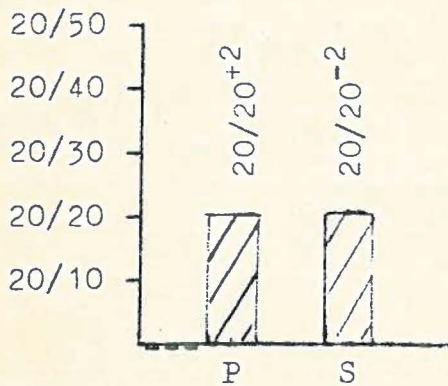
compared was the difference in acuity between the two types of lenses, not the difference in the types of acuity measurements.

CONCLUSION

In conclusion, patients who possess clinically significant residual astigmatism may actually obtain a quantitative and qualitative improvement in vision while wearing a front surface aspheric contact lens instead of a spherical contact lens. A Panofocal lens may be considered an alternative when fitting patients who demonstrate residual astigmatism and who obtain unacceptable vision while wearing spherical or toric lenses.



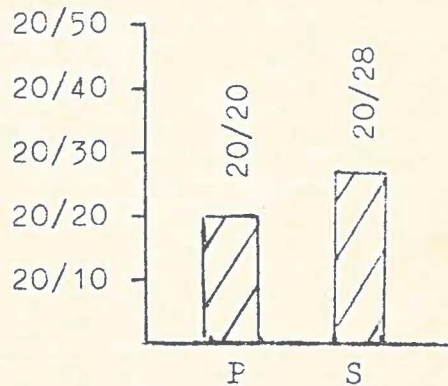
(Figure 1a)



P: Panofocal
S: Silcon

SNELLEN
VISUAL ACUITY

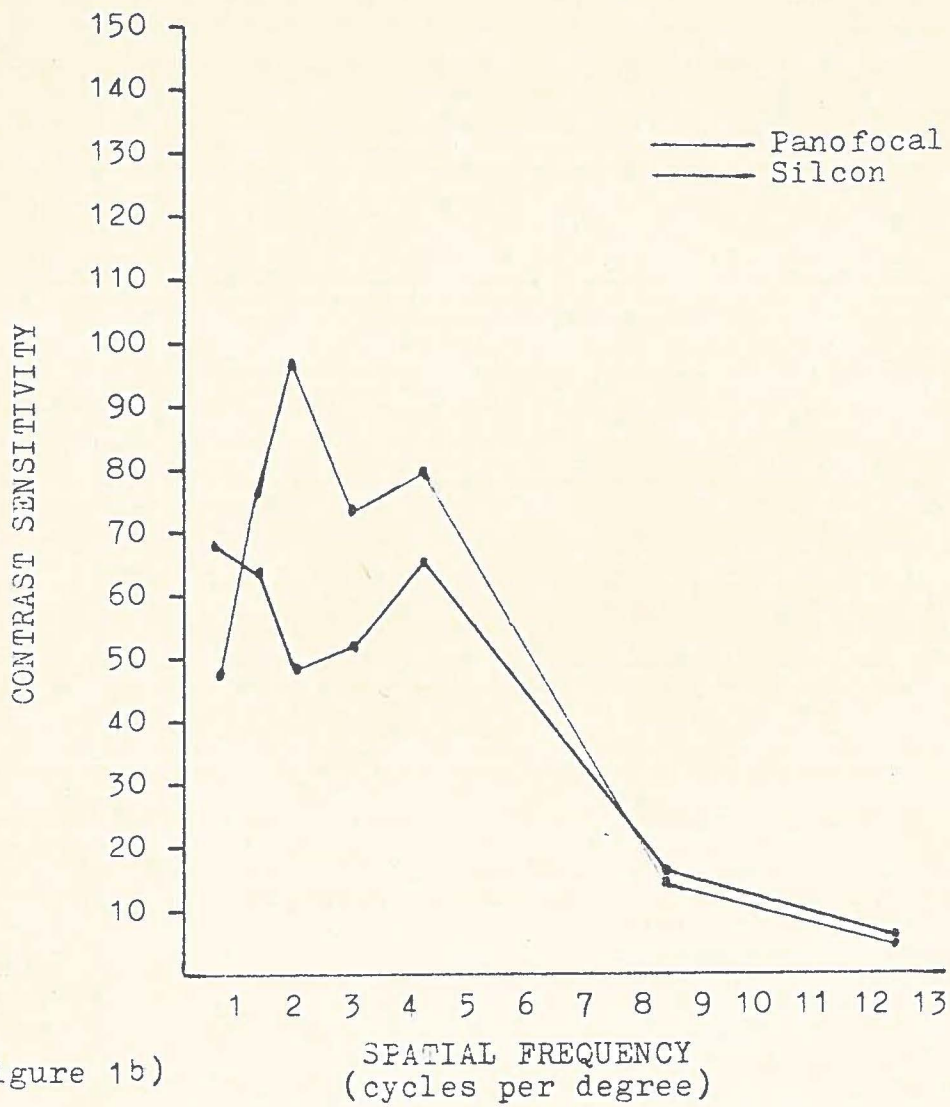
(Figure 2a)



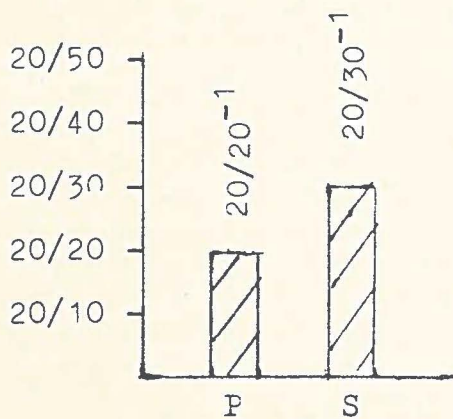
P: Panofocal
S: Silcon

PSYCHOMETRIC
VISUAL ACUITY

(Figure 3a)

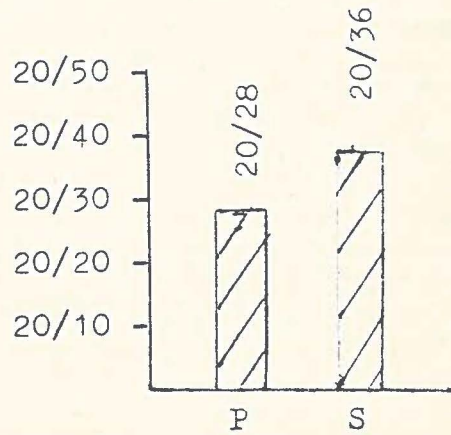


(Figure 1b)



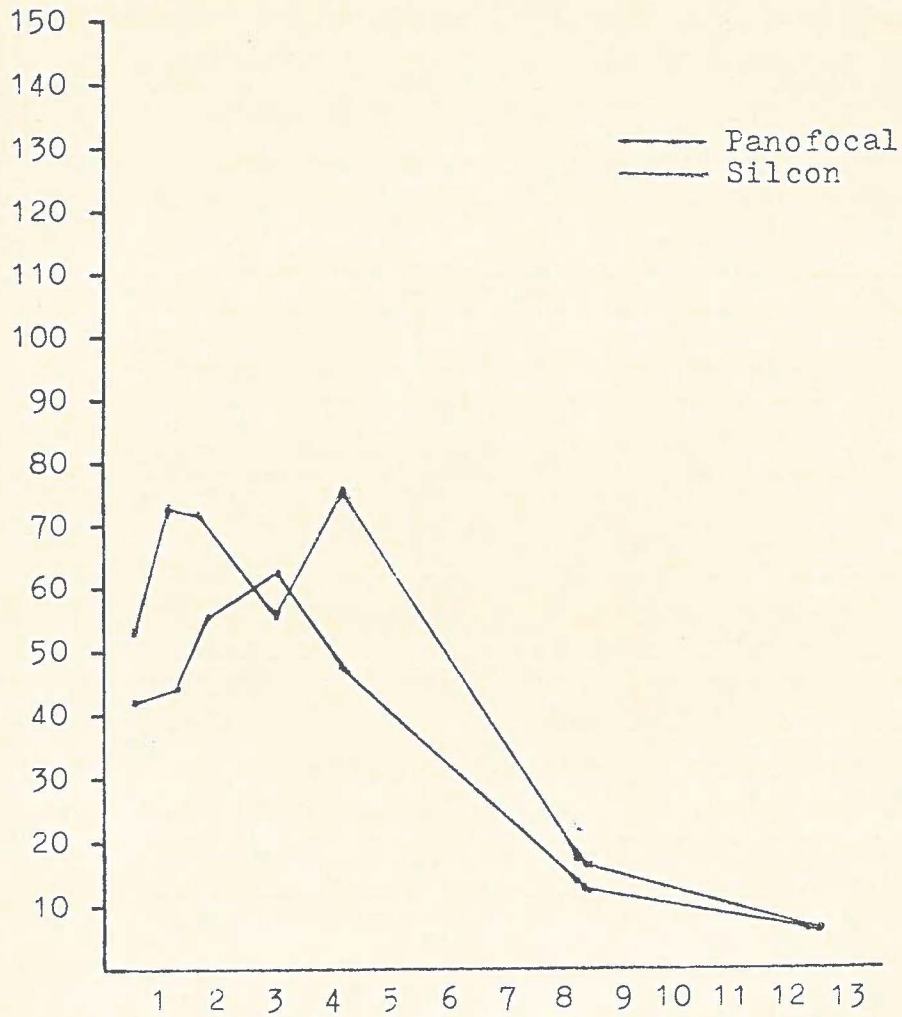
P: Panofocal
S: Silcon
SNELLEN
VISUAL ACUITY

(Figure 2b)



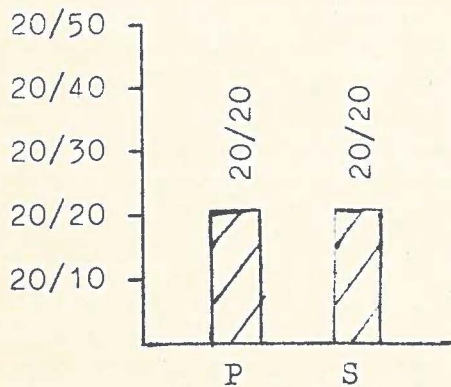
P: Panofocal
S: Silcon
PSYCHOMETRIC
VISUAL ACUITY

(Figure 3b)



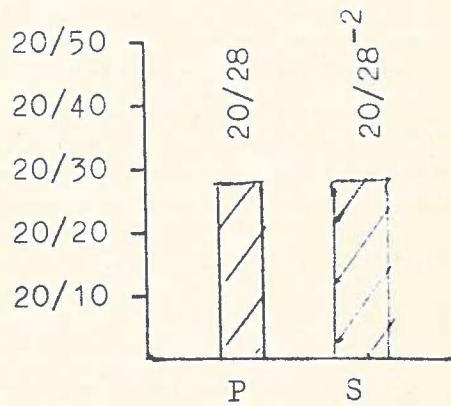
(Figure 1c)

SPATIAL FREQUENCY
(cycles per degree)



P: Panofocal
S: Silcon

SNELLEN
VISUAL ACUITY

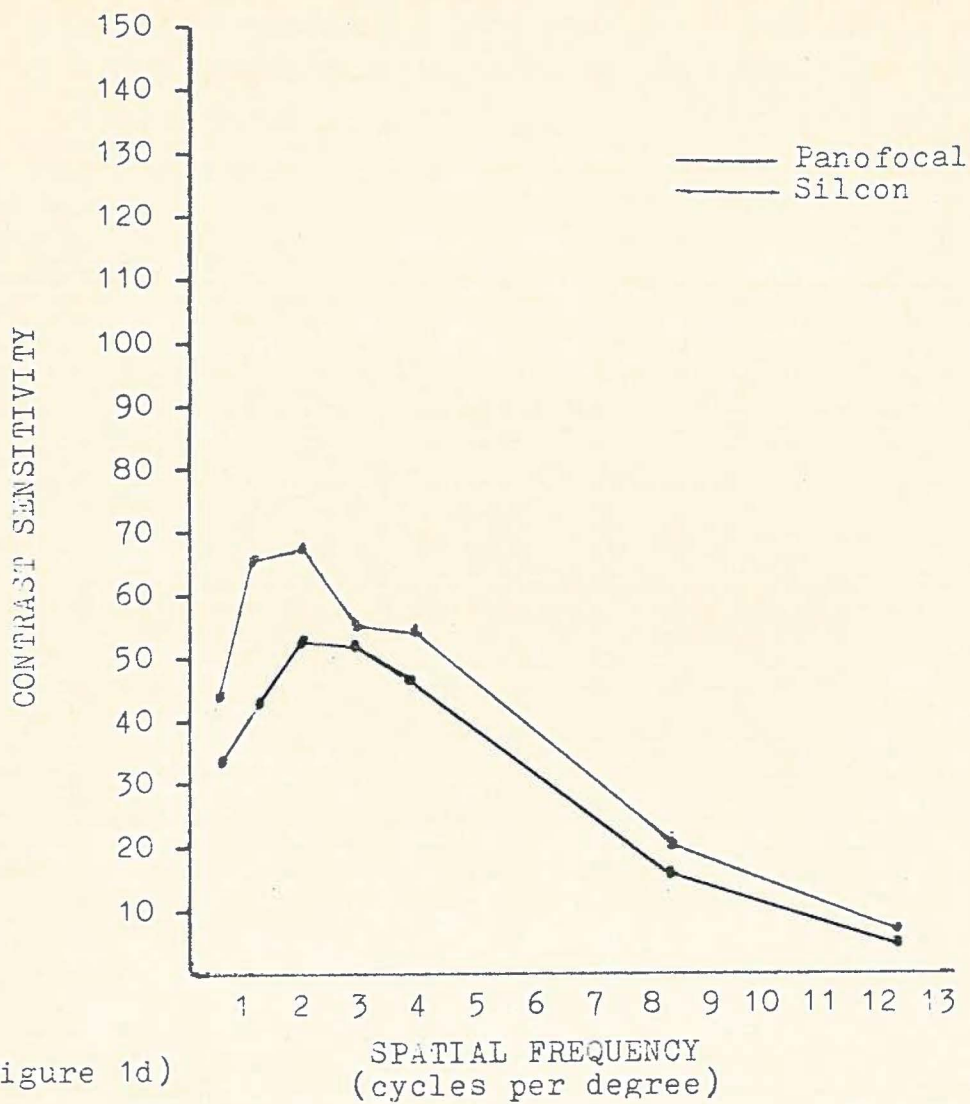


P: Panofocal
S: Silcon

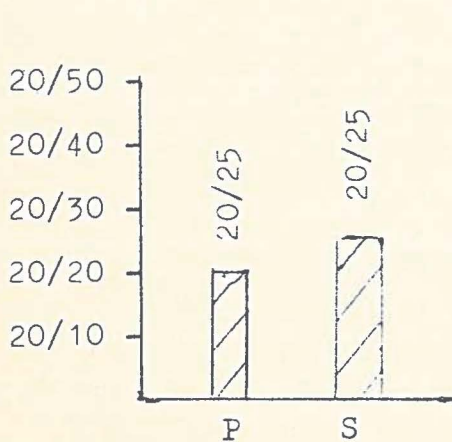
PSYCHOMETRIC
VISUAL ACUITY

(Figure 2c)

(Figure 3c)



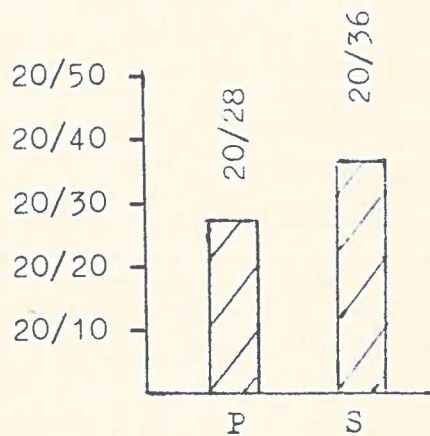
(Figure 1d)



P: Panofocal
S: Silcon

SNELLEN
VISUAL ACUITY

(Figure 2d)



P: Panofocal
S: Silcon

PSYCHOMETRIC
VISUAL ACUITY

(Figure 3d)