How Important Is Optical Placement in Multifocal Lenses?

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Introduction

A strong relationship between the cornea and the pupil is essential for proper visual control. A centering error in multifocal contact lenses is associated with the patient's visual acuity and binocular vision. If the center of the near optics and the patient's line of sight are misaligned, the patient may experience distance vision difficulties, leading to a decreased quality of life.

Methods

The subjects of this case report are a 45-year-old female wearing simultaneous optical designs and multifocal contact lenses. The current lens design was optimized for both distance and near vision. To further enhance performance, the patient was always told that her near vision would be as good as the worn in the trial.

Results

During the follow-up evaluation, a standard multifocal near point card was used to determine the patient's level of near vision. With her habitual lenses, she could only read the 20/28 line with both eyes. With the study lenses, the patient was able to obtain the 20/20 vision near visual acuity at despigmentation and 20/25 near visual acuity at the final trial. While the patient reported no noticeable improvements wheng looking computer screens or her cell phone, she did note the near vision was better when looking at printed material. At the conclusion of the study, the patient was asked which lenses she preferred overall; she stated that she preferred the study lenses and wanted to continue with them.

Discussion

Many factors contribute to the success of multifocal contact lenses. As this study shows, the alignment of the lens optics can be of great importance. The optics of soft, simultaneous-design, multifocal contact lenses can be optimized by nominating the lens and moving the optics so that they are centered near the patient's line of sight. A new lens design that offers the opportunity to de-center the multifocal optics and align with a patient's visual axis may provide a promising outlook for patients with larger numbers of patients to determine the true magnitude of improvement. It may also provide a solution for patients with such a design.

Conclusion

A new lens design that offers the opportunity to de-center the multifocal optics and align with a patient's visual axis may provide a promising outlook for patients with larger numbers of patients to determine the true magnitude of improvement. It may also provide a solution for patients with such a design.

Special Thanks

To SpecialEyes, for supporting this research and for the flexibility to present this case report.

To Renée Caccia and Matthew Lamps, for introducing me to the concept of “line of sight” and its importance in multifocal lens design.

References


Figure 2 Right eye and left eye topography of the base cornea prior to multifocal fitting. The large cross represents the patient’s line of sight, while the small green and crosslines indicate the geometric center of the pupil. The green circle represents the pupil-centered position, while the red circle represents the optical center for comparison.

Figure 3a Right eye topography performed over multifocal lens with 0.30 mm de-centered optics. Notice the approximate 0.30 mm mismatch between the center of the new optics and the patient’s line of sight.

Figure 3b Right eye topography performed over multifocal lens with 0.60 mm de-centered optics. The increase in the amount of the centering in the multifocal lens may more closely align the center of the near optics with the patient’s line of sight.

Figure 4 The line of sight correlates to the patient’s visual axis and pupil. It is the point at which the patient perceives the image. The line of sight is determined by the point of fixation and the position of the pupil. The line of sight is often referred to as the “point of regard” or “point of vision”.

Figure 5 The main difference between the center of the pupil and the patient’s line of sight is the size of the pupil. The pupil size can vary significantly depending on the patient’s visual demand. The pupil size can also be affected by factors such as age, gender, and lighting conditions.

Figure 6 The line of sight is often referred to as the “point of regard” or “point of vision.” It is the point at which the patient perceives the image. The line of sight is determined by the point of fixation and the position of the pupil. The line of sight is often used to determine the geometric center of the pupil.

Figure 7 The line of sight is often referred to as the “point of regard” or “point of vision.” It is the point at which the patient perceives the image. The line of sight is determined by the point of fixation and the position of the pupil. The line of sight is often used to determine the geometric center of the pupil.