Comparison of Accommodation with Rigid and Flexible Contact Lenses

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Abstract  
Measurements were made of the amplitude of accommodation for myopes wearing spectacles, rigid contact lenses, and flexible contact lenses. Both forms of contact lenses placed greater accommodative requirements on the myope than did spectacle correction, but no significant difference was found between the two types of contact lenses in this respect.

Key Words: accommodation, accommodative amplitude, contact lenses, rigid contact lenses, flexible contact lenses, myopia

It is widely known that some myopes have difficulty with near vision when they switch from spectacles to rigid contact lenses. Increased accommodation required of myopes when they wear contact lenses has been cited as the cause of their difficulty.1-3 Yago and Kato1 have recently suggested that wearers of flexible contact lenses may experience more difficulty at near than wearers of rigid contact lenses. They experimentally determined that greater accommodation was required of flexible-contact-lens wearers than of spectacle wearers, but they did not attempt to prove their suggestion that a different accommodative response was required of myopes who wore flexible and rigid contact lenses.

From optical calculations we expect a myope to accommodate more with contact lenses than with spectacles, and to accommodate equally with rigid and flexible contact lenses. Consider the following example. A myope with an ocular refraction of -4.00 D is corrected with a spectacle lens of -4.25 D placed at a vertex distance of 12 mm. This myope would have to exert 2.63 D of accommodation to see an object clearly at 33.3 cm in front of the spectacle plane (using the corneal plane as a reference). If his eye were then fitted with an "on-K" rigid contact lens of 0.2-mm center thickness, the accommodation required for him to see clearly the same near object 34.5 cm from the corneal plane would be 2.93 D (according to thick-lens theory). Finally, if the same person were fitted with the assumed best-fit Bausch and Lomb Soflens flexible contact lens, which conforms to the central cornea,4 he would still have to accommodate 2.93 D to see the same near object clearly. If he were fitted with a lathe-cut lens that had different fitting characteristics, an almost identical result would be obtained.

The purpose of our study was to determine whether myopes accommodate more for near objects with flexible contact lenses than with rigid ones, as suggested by Yago and Kato,5 or whether accommodation is

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equal with those 2 types of lenses, as predicted from optical calculations. Our experimental approach was to measure the amplitude of accommodation for myopes wearing spectacles, rigid contact lenses, and flexible contact lenses.

METHODS

The investigations were carried out on 7 subjects, 5 males and 2 females. These were all myopes, aged 20 to 32, ranging in spherical equivalence from -1.50 to -10.00 D.

The near point of accommodation was determined monocularly using an experimental arrangement similar to that described by Fitch. The examiner manipulated the target while the subject observed a row of letters (20/20 at 40 cm) displayed at a luminance of 51.39 cd/m². This procedure is similar to the clinical push-up technique.

Each subject was tested wearing spectacles, a rigid (PMMA) contact lens, and a flexible (Bausch and Lomb Softens) contact lens. In each case, any residual refractive error was corrected before the measurements were carried out, so that 20/20 visual acuity was always obtained. Six measures of accommodative amplitude were obtained from each patient wearing each corrective device.

RESULTS AND DISCUSSION

Table 1 shows the amplitudes of accommodation for each of the 7 subjects wearing spectacles, rigid contact lenses, and flexible contact lenses. Table 2 gives for each subject the differences between the mean amplitudes of accommodation that were found for the 3 forms of correction. The amplitude of accommodation was found to be significantly less (student's t-test, P < 0.1) with both types of contact lenses than with the spectacles, while the 2 contact-lens corrections did not differ significantly from each other.

Differences between the subjects' amplitudes of accommodation when they were tested under the same conditions are attributed to variations in age and refractive error, as well as to the criterion of blur.
when the near point of accommodation is established.

Table 2 shows that both rigid and flexible contact lenses placed a greater burden on accommodation than did spectacles. The magnitude of this increase can be calculated from the different amplitudes of accommodation recorded for each subject for the 3 conditions of measurement. However, no statistically significant difference in accommodation was found to be required of the subjects when they wore the 2 forms of contact-lens correction.

These results suggest that myopes should have no greater near-vision difficulties due to accommodative requirements when they wear flexible contact lenses than when they wear rigid ones. If such difficulties do exist, then other explanations must be considered—for example, the distortion of a flexible lens by the lids when the wearer looks down. Our results do not support the suggestion that more accommodation is required with flexible than with rigid contact lenses.

REFERENCES

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