

## SPECIAL LENSES FOR THE POOR-SIGHTED

ROSCOE J. KENNEDY, M. D.

*Contact Lenses.* Many persons on the borderline of economic blindness can be helped by the use of special lenses. Keratoconus is one condition which has long been recognized, but for which treatment has not offered a good prognosis for improvement in sight. In recent years, however, contact lenses have been developed to help this condition, and in the past year even greater benefits have been obtained from the use of plastic contact lenses (Fig. 1).



FIGURE 1. Plastic contact lens.

Keratoconus as defined by Duke-Elder<sup>1</sup> is "a condition which involves stretching of the cornea in an axial part becoming manifest usually in the youth or adolescent and resulting in a visual impairment owing to the development of a high degree of astigmatism. It is a non-inflammatory ectasia or in a sense an anterior myopia."

The etiology of keratoconus is unknown. Most of our cases at the Clinic, however, have been associated with a definite allergy. In other cases a coexisting endocrine imbalance has been noted. One patient, a woman past 50, had normal vision ten years ago. A recent examination following a thyroidectomy and subsequent hypothyroidism showed a definite keratoconus. In another case the condition occurred following pregnancy. In one case the condition occurred three months after the use of sulfathiazole.

Keratoconus is usually bilateral. Thirty-three of 39 cases seen at the Clinic, or about 90 per cent, were bilateral, and four cases were unilateral. To date, I have seen the condition only once in successive generations. This occurred in a father and daughter both of whom had a unilateral keratoconus with the other eye normal.

Contact lenses may also be used in other conditions such as keratitis, neuroparalytica, etc., and in place of ordinary glasses in hyperopia or myopia.

At the present time, we are using the Obrig plastic lenses which have a distinct advantage over the old glass lenses in that they are un-

breakable, weigh about one-third less, and can be much more accurately fitted. Five patients with keratoconus have been fitted with contact lenses, all of whom had a bilateral condition except one patient, a young man of 19. Twelve patients have been fitted for compound myopic astigmatism with errors varying from a minus 1.75 to minus 28.00 diopters, and three patients have been fitted with contact lenses for aphakia. In all about 30 plastic lenses are being used by patients at this Clinic, and to date they have had no difficulty with them. In only two cases did we believe that contact lenses could not be accurately fitted, and these patients were advised to have corneal transplants.

The technic for fitting contact lenses is not difficult. The only requirements are proper equipment and the cooperation of the patient. Before fitting the lenses the patient should have a routine refraction under mydriatic in order to obtain the maximum vision with correction. If there is over 0.75 diopter of astigmatism, it is generally accepted that contact lenses are not indicated. The trial contact lens is then placed in the eye, and refraction is done with the lens in place. At the same time the vertex distance from the contact lens to the trial lens should be measured. After the eye has been completely anesthetized, an impression of each eyeball is taken by means of a casting shell and Negocoll. The casting with Negocoll is a very accurate reproduction of the eyeball which the inner surface of the contact lens will fit. A semi-finished lens is then made which allows for any changes which may be necessary to achieve the vision obtained by the original examination. The lens should also be checked at this time for both scleral and corneal fit. Before being inserted into the eye, the lens is filled with buffer solution, of which Gifford's solution is the most commonly used with a fairly high pH (between 8 and 9).

Four factors are involved in the fitting of contact lenses. (1) The optical fitting consists of finding the curvature of the trial contact lens used in refraction, the power of the lens, and the vertex distance. (2) The physical fitting consists of taking the cast. (3) The chemical fitting involves taking the pH of the tears in order to determine the proper buffer solution which will be tolerated by the eye. (4) The physiologic fitting includes a consideration of the patient as well as instruction in inserting and removing the lens. Therefore, the requisites for a good fitting contact lens are: (1) It must be the proper size covering a large area without any peripheral pressure. (2) It must not be in contact with the cornea or limbus. (3) It must not ride nor rub over the cornea or the limbus when the eye is moved. (4) Air bubbles must not form under the glass. (5) The glass must not cause the formation of corneal abrasion. (6) The optical correction must give the desired vision. Only when these requisites are filled can contact lenses be considered satisfactory. It must be remembered, however, that although we can promise the patient a proper fit

with vision as good as or better than the present correction, we cannot guarantee how long they will be able to wear the contact lenses. Usually patients wear the lenses one or two hours daily until they develop a tolerance to them. The principal disadvantages of contact lenses are that they are: (1) difficult to manipulate, (2) uncomfortable—for example, they may be too-tight, although this has been greatly eliminated by the use of plastic lenses,—and (3) relatively high-priced.

*Aniseikonia.* Another condition which has received considerable publicity is aniseikonia, which means any difference in the relative size and shape of the ocular image. Boeder<sup>2</sup> has defined aniseikonia as “that condition of the binocular visual apparatus in which the ocular images are unequal in either size or shape, or both.” The term “ocular image” is applied to the final impression which reaches consciousness in the higher brain centers, and therefore, its effective size depends not only upon the dioptric image formed on the retina of the eye, but also upon the distribution of the receptive retinal elements and upon the physiologic and cortical processes involved. It follows that aniseikonia may be caused by an anomaly in any one or combination of the elements involved in the formation of the ocular image. This important observation excludes the possibility of calculating the amount of aniseikonia from a given prescription.

That aniseikonia exists in certain troublesome conditions, such as monocular aphakia, has long been recognized. In antimetropia and in anisometropia most authorities agree that one difficulty that the patient experiences results in differences in the size of the image. Patients may satisfy the recognized requirements for binocular vision and yet have aniseikonia. Formerly many of these cases were called ocular neuroses. The difference in the size and shape of the ocular image may be classified as follows: (1) overall difference, one image large in one meridian only; (2) meridional difference, one image large in one meridian only; (3) compound difference, difference may be various combinations of overall and meridional differences.

The symptoms of aniseikonia are the same as those of common refractive errors, that is, photophobia, train and car sickness, fatigue, difficulty in reading, dizziness, gastrointestinal upsets, headaches, etc. If correction of refractive errors fails to bring relief, the test for aniseikonia is indicated.

The treatment consists of lenses which are designed to correct not only the focus of the rays entering the eyes, but also the magnification of the images formed on the retina.

*Telescopic Lenses.* A large group of patients whose symptoms are not necessarily due to a refractive error cannot be given satisfactory vision

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with any single ophthalmic lens. Telescopic lenses are of value in high myopia with marked retinal and vitreous damage, in partial cataracts, corneal opacities, chorioretinal disease, glaucoma, and uveal diseases with fixed and partially occluded pupil. However, they are not of much use in retinitis pigmentosa, optic atrophy, and inoperable cataract. The disadvantages of telescopic lenses are that they give the patient tubular vision and that they are cumbersome to use.

### SUMMARY

All these special lenses offer some hope for the patient who is hard to fit or cannot be helped with ordinary lenses. They should be added to the armamentarium of all oculists who should be acquainted with their use and the technic of fitting them. By the use of special lenses many patients not only have been brought out of a world of blindness but also have been made useful again and have been able to carry on their usual occupation.

### REFERENCES

1. Duke-Elder, W. Stewart: Text-book of Ophthalmology (St. Louis: C. V. Mosby Co. 1938) Vol. II.
2. Boeder, Paul: Personal Communication.