

CONTACT LENSES AND THE LOW VISION PATIENT

Contact lenses may be the better option for some low vision patients says Elvin Montlake

The definition of low vision may not be as straightforward as it seems. Low vision can be measured or assessed in terms of the actual visual disability or the visual impairment created.

A recent study guide for physicians stated: 'Low vision is said to exist when ordinary glasses, contact lenses, medical treatment and/or surgery are unable to correct a person's sight to the normal range'.

A suggested definition in very general terms may be: 'Low vision may be considered as a reduction in visual acuity or a constriction of visual fields, or a combination of both, below generally accepted standards which cannot be corrected by normal spectacles. It is a substantial and permanent handicap'.

The 'generally accepted standards' are the criteria for registration as blind or partially sighted:

Blindness

- a** Visual Acuity below 3/60.
- b** Visual Acuity between 3/60 and 6/60 with significantly contracted fields.
- c** Visual Acuity 6/60 or better with gross field restriction, especially in the lower quadrant.

Partial sight

- a** Visual Acuity between 3/60 and 6/60 with full fields.
- b** Visual Acuity between 6/60 and 6/24 with moderate contraction of fields, opacities in the media or aphakia.
- c** Visual Acuity of 6/18 or better with gross restriction of field such as in hemianopia, retinitis pigmentosa or glaucoma.

There are specific criteria for children.

- a** Infants and young children who have congenital ocular abnormalities leading to visual defects should be certified as partially sighted, unless they are obviously blind.
- b** Children aged four or over should be certified as blind or partially sighted according to binocular corrected vision. Children should be re-examined at least every twelve months -or more frequently if there appears to be any worsening of the condition.

The use of contact lenses in low vision

Although the first contact lenses made were for protective rather than refractive purposes, during the early practical development of contact lenses in the period circa 1880 to 1900, researchers

such as August Muller, Fick, Eugene Kalt and others foresaw the use of contact lenses to correct certain pathological conditions such as keratoconus, aphakia and high myopia. The material used was glass and the lenses were blown or ground, usually to match moulds. The two main manufacturers were Muller of Wiesbaden and Carl Zeiss of Jena.

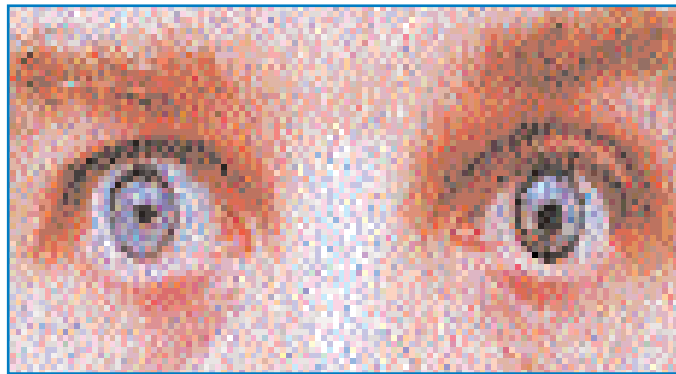
Because of the limitations of the material, manufacturing technology and the lack of suitable wetting and lubricating solutions these early lenses were very limited in use, being, as one can imagine, difficult to tolerate or wear for more than very short periods of time. Although Zeiss produced the first contact lens 'fitting sets' in the early 1920s for the correction of keratoconus, little progress or interest was shown in contact lenses for many years, but the foundations had been laid for the future. Today, however, we have an extensive and ever developing range of materials, advancing technology and a wide range of contact lens solutions and ocular lubricants. The use of contact lenses in low vision is now a much more viable option. Indeed in some conditions it is the only option.

Keratoconus

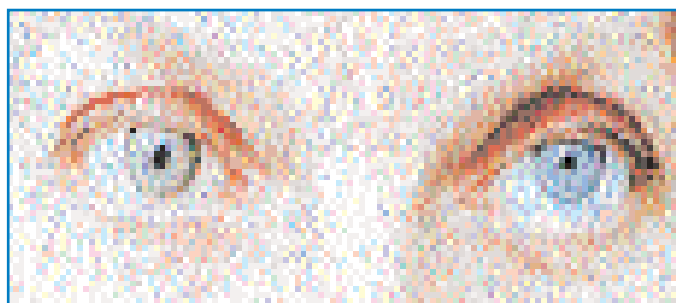
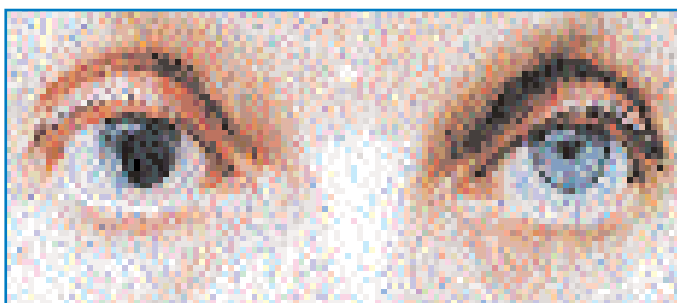
Although a relatively rare condition of uncertain aetiology, keratoconus is probably the most common cause of low vision that the average contact lens practitioner is likely to meet in practice. A non-inflammatory progressive anomaly in which the central cornea protrudes, thus bulging forward in a cone shaped fashion, signs of keratoconus normally first appear around puberty. Initially it may only appear in one eye but in the long term both eyes are likely to be affected. The main symptom is a loss of visual acuity, which cannot be corrected by normal spectacles due to irregular myopic astigmatism. Correction of this condition with contact lenses can dramatically improve visual acuity. Most keratoconus patients are fitted with gas permeable rigid corneal contact lenses. Spherical and aspherical designs are available and much has been written regarding the fitting of the keratoconic patient. In the early stages of the condition soft contact lenses may be suitable. More recently soft lenses have been developed which appear to help with more advanced stages of keratoconus. In the later stages of the condition it may be necessary to fit scleral lenses. These may be preformed or moulded PMMA lenses or, more commonly nowadays, preformed gas permeable scleral lenses. For the patient intolerant of rigid or hard lenses, hybrid lenses with a rigid gas permeable central zone and a soft peripheral skirt are available. As is also the 'piggy-back' system which consists of a soft lens fitted to act as a bandage lens for comfort over



▲1: Before :2▼



▲1: After :2▼

▲ These patients, both suffering from iris coloboma, have been cosmetically corrected with contact lenses. *Photographs by Cantor & Nissel*

which is fitted a rigid gas permeable corneal lens. With the advent of daily disposable soft lenses this method has become much more viable.

Aniridia

This is normally a congenital condition although it may be acquired due to trauma. There is complete, or almost complete, absence of the iris. The enlarged pupil causes photophobia. Often nystagmus and amblyopia are present with this condition. Larger corneal or scleral lenses may be fitted but most patients are likely to be fitted with soft lenses. The lenses would have a clear or tinted pupil with an opaque painted or printed area corresponding to the natural iris diameter. Additional black lining to reduce light scatter may be required. Although excellent cosmetic results can be achieved with improved visual acuity, there may be some visual disturbance on blinking as well as a restricted field of view.

Iris coloboma

A congenital, pathological condition, or operative anomaly, in which a portion of the iris is lacking. If congenital, the absence of iris portion is usually located inferiorly. As well as the unattractive cosmetic appearance, the condition may cause photophobia and poor vision due to glare and scattering of light. The patient would benefit from being fitted with an opaque iris contact lens to significantly reduce these problems as well as improve cosmesis. As with aniridia, a soft lens would be first choice.

Albinism

A congenital condition characterised by lack of pigment in the skin, hair, iris,

retina and choroid. Ocular albinism affects the pigment in the eyes only. Vision is poor with photophobia and, often, nystagmus present. There may be high refractive errors with significant astigmatism. A range of contact lenses similar to those suggested for aniridia are available. Scleral lenses with an opaque scleral zone may help further reduce light scatter and thus photophobia. For infants and young children tinted soft lenses are helpful in the early stages although great care is required with hygiene.

Nystagmus

A regular, repetitive involuntary movement of the eye often associated with poor macular development. The direction, frequency and amplitude of these movements are variable. Nystagmus can be induced, acquired or congenital. It is often associated with other conditions such as aniridia and albinism, which reduce visual acuity. Many patients, though not all, with nystagmus can achieve better visual acuity with contact lenses than spectacles. Nystagmus is frequently associated with moderately high astigmatism and so contact lenses may provide better stability of the retinal image and thus improve resolution.

High myopia

In cases of extreme myopia caused by a stretching of the posterior pole of the eye, contact lenses will give a much larger retinal image and a significantly improved field of view compared to equivalent power spectacle lenses. This is due to the contact lens resting on the anterior surface of the cornea rather than a distance away from the eye. The back vertex power of the contact lens will also be much less than that of the spectacle

lens for the same reason. Where visual acuity cannot be adequately improved by contact lenses alone it is often best to correct the refractive error with contact lenses and in addition supply suitable low vision aids.

Corneal and media abnormalities

In cases of corneal front surface irregularities caused by corneal stromal scarring due to corneal dystrophies, herpetic keratitis, interstitial keratitis and trauma many of the types of lenses suggested for keratoconus may be useful. Pinhole contact lenses may also be helpful in these conditions. These lenses will reduce the blur circle and enhance contrast. A single pinhole or several pinholes may be used, as may stenopaic-slit contact lenses. Pinhole contact lenses have the advantage over pinhole spectacle lenses in that normal ocular movement is possible as the contact lens moves with the eye.

These pinhole or stenopaic-slit contact lenses may also be helpful where there are media abnormalities such as opacities of the vitreous or crystalline lens. Pinhole apertures will vary from 0.50mm to 2mm or more depending on the condition and patient requirements. However gross defects of the cornea such as keratoconus may not benefit by the use of pinhole lenses.

Post-keratoplasty

Following a corneal graft soft contact lenses are often prescribed to protect and aid the healing process. Where satisfactory visual acuity cannot be obtained post-operatively due to high or irregular astigmatism the fitting of rigid gas permeable contact lenses may be

indicated to enable the patient to obtain better visual acuity. These must be fitted with great care, as abrasions or staining of the grafted tissue are not acceptable. Frequent after-care checks are required. Use of the 'piggy-back' system previously described may be considered.

Microphthalmia

A congenital anomaly in which the eyeball is abnormally small and usually deeply set in a small orbit. The cornea is normally very steep with high hypermetropia. Although a contact lens would be fitted more for cosmetic rather than refractive reasons, in the case of an infant or young child accommodation is present. Therefore high plus lenses (+10.00D or greater) may give some improvement in visual acuity as well as make the eye look larger. High plus power tinted soft contact lenses would generally be fitted.

Aphakia

It is debatable whether aphakia in isolation should be classified as a condition of low visual acuity. However, aphakia is the result of cataract extraction, which is itself a cause of low visual acuity. In the case of an older Aphakic patient there may be other pathological conditions present such as age related maculopathy.

Following cataract surgery the vast majority of adult patients will have some form of intraocular implantation. For the few, where an implant is not considered as a viable option or where an implant has proved unsuccessful, a contact lens may be considered. Providing there are no underlying problems a contact lens should give very satisfactory visual acuity. Compared to a spectacle lens, there will obviously be a more acceptable cosmetic

appearance as well as an improved field of view. However, for the low vision patient, visual acuity may not be as good as with spectacles due to the loss of spectacle magnification. In the case of an unilateral aphake the contact lens offers the chance of obtaining some degree of binocular function due to the reduction in spectacle magnification in the corrected aphakic eye. For the infant with congenital cataract early treatment and optical correction is essential. Soft lenses, fitted on an extended wear basis, may be the only option initially. These may be fitted as early as three to four months after birth. Later on other lenses such as daily wear soft or rigid gas permeable lenses may be fitted.

Contact lens telescopes

First suggested by Dallos (1936), a high minus power contact lens is used as the eyepiece in a Galilean telescopic system. A high plus power spectacle lens mounted in a suitable frame is used as the objective lens. The power range of contact lenses used would be between -25.00D to -40.00D, therefore soft lenses (or scleral lenses) might be used in preference to rigid corneal lenses for better stability. The spectacle objective lens, power range +20.00D to +30.00D, would be of aspheric design to enhance the field of view. The length of the telescopic system would be equal to the separation of the lenses, thus the vertex distance of the spectacles from the cornea. If a low vision patient, otherwise emmetropic, required 2x magnification a contact lens power -40.00D could be fitted with a spectacle lens power +20.00D placed 25mm in front of the contact lens. However this vertex distance is both difficult to obtain and maintain. As the overall length of the

system is the difference in focal length of the two lenses, if the power of the contact lens was reduced to -30.00D and the power of the spectacle lens was kept at +20.00D the separation between the two lenses would be reduced to 16.67mm but the magnification obtained would only be 1.5x. Although there have been reports of some success with contact lens telescopes, the limited magnification that can be practically obtained compared with the many disadvantages and potential hazards of fitting and supplying such systems suggest that the concept is more theoretical than practical.

Further reading

1. Michel Millodot, Dictionary of Optometry and Visual Science, fourth edition, Butterworth Heinemann.
2. Christine Dickinson, Low Vision, Principles and Practice, Butterworth Heinemann.
3. Helen Farrall, Management of Visual Handicap, Blackwell Scientific Publications.
4. Andrew Gasson and Judith Morris, The Contact Lens Manual, A Practical Fitting Guide, second edition, Butterworth Heinemann.
5. Stone and Phillips, The History of Contact Lenses A.G.Sabell, Contact Lenses, third edition, Butterworth Heinemann.

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