

## Patient Guides Series

When you are considering laser eye surgery, this series of informative guides will help in making the best decision for you and your eyes. Please call us on **0845 3300010** or visit [www.horizoneyecentres.com](http://www.horizoneyecentres.com) For more information or to request other Patient Guides in this series, please visit our website, click on Patient Guides on the home page

## Patient Guides #3: What Alternatives Do You Have for Your Laser Eye Treatment?

### *Alternatives to Laser Vision Correction*

#### **I. Non-surgical Methods of Correction**

##### **Glasses**

Obviously, glasses are the most common method by which people correct their refractive error and achieve good vision. They range from being relatively cheap to very expensive, especially when using costly high-index glass, plus the cost of ever-popular designer frames. Many patients have spent £300 to £400 or more on a single pair of glasses. The risk of corneal injury from accidental damage to the lens is minimal with normal use. They may, however, be unsafe or impractical during various leisure activities e.g. sports, and can be uncomfortable. An additional problem for those with high refractive errors is distortions and reduction in peripheral vision, combined with an inability to achieve good central vision.

The *presbyope* (patients over 40-45) may end up with multiple pairs of glasses, e.g. a distance pair, bifocals, reading glasses for when using contact lenses, prescription sunglasses, and a bag to carry all these in! Many such patients are relieved after laser correction to lighten their load down to a pair of reading glasses (and an over-the-counter pair of sunglasses for the UK's annual week of sunshine!)

Who first invented spectacles? While on his travels to China, Marco Polo recorded seeing people wearing framed lenses. They were held in place with the use of weighted cords hanging over their ears. At a similar time in Italy, Venetian glass was being produced that could be mounted in frames and held on the face. Also, a tombstone in Italy of a man called Armati bears an inscription that reads "the inventor of spectacles". Some time later in Britain, Roger Bacon developed these ideas further.

##### **Contact Lenses**

Contact lenses have been steadily increasing in popularity since their introduction in the early 1950s. Recent changes in materials have meant that they are now much more comfortable and safer than in the past. They can provide very good vision, even for those with high degrees of refractive error. Rigid gas-permeable lenses can provide excellent visual acuity, which may be

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slightly better than one might get following laser correction (because of the way that these lenses mask imperfections on the corneal surface).

Initially made of glass, early lenses were too rigid and difficult for many peoples' eyes. Popularity increased after the introduction of new plastics, allowing greater comfort and extended wearing time. The latest generation of silicone hydrogel lenses allow continuous night and day wear for up to one month. Newer materials are being developed that may allow even longer durations!

The downside of contacts is that they are inconvenient to use and may not be tolerated for a full day, especially when working in a dry atmosphere such as an air-conditioned office. Lenses can lead to dry eye symptoms, and can cause swelling of the cornea, erosions and infections of the corneal surface. Even warpage of the shape of the cornea itself. The risk of infection is greater from contact lens use over time than it is from laser correction. Some people can become intolerant of their lenses, and these patients are not uncommon among refractive surgery candidates. The various solutions necessary can lead to allergic symptoms and signs, with inflammation and swelling of the conjunctiva behind the eyelids. Prolonged use or overuse can lead to oxygen deprivation, with the result that blood vessels start to grow inwards onto the surface of the cornea.

Costs are cumulative for contact lenses. Most patients will spend the same over 5-7 years of disposable lens use, not including the cost of glasses, as the cost of laser vision correction.

### Orthokeratology

A series of contact lenses are used over an extended period in order to induce a change in the shape of the cornea, and with varying degrees of success. The cornea will always try to return to its natural shape, and so retainer lenses must be worn intermittently to maintain the new shape. The same risks such as infection and others described above under Contact Lenses also apply to orthokeratology.

## II. Surgical Methods of Correction

### Keratophakia

An early and discontinued procedure for longsight involved making a flap in a similar manner to the LASIK procedure, inserting a disc of donor tissue, then replacing the flap. The newly steepened cornea would now have eliminated or reduced the original hyperopia.

Attempts have long been made for a suitable material to use that would be functional and tolerated by the cornea (see Intrastromal lenses).

### Intrastromal Lenses (corneal/stromal inlays)

This new technique involves the insertion of a very fine contact lens underneath a LASIK-type corneal flap, using a biocompatible material. It might offer an excellent treatment for higher degrees of hyperopia without the unpredictability found in older types of keratophakia (see Keratophakia insert box). The new lenses have been developed by the Anamed Corporation using the trade name Permavision®. They have received the CE mark and are now available in the UK.

While keratophakia has been under development for the past 50-plus years, it took Anamed's proprietary Nutrapore material to make the procedure viable. It mimics the properties of the stroma for water content, refractive index, optical clarity, fluid transport, and permeability of

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metabolites and oxygen. The micron-precision lenses are placed inside the cornea in a sutureless procedure. After a hinged flap is made in the cornea just as in LASIK, the lens is placed and centered over the pupil. The flap is then folded back into place. No stitches are necessary. When inserted under a flap in the cornea, the lenses permanently reshapes the outer surface of the eye to bring your vision into focus.

One of the benefits of inserting a lens for longsight, instead of removing tissue with a laser, is that the procedure is reversible and adjustable. If the focus isn't quite right, you can lift the flap and change the lens. If you want to go back to glasses or contact lenses, the Permvision® inlay can easily be taken out. The main drawback presently is the formation of haze around the lenses in some patients.

Anamed is also developing inlays designed to treat the loss of reading vision in the over 40s (presbyopes). The risks are the same as for those related to the flap from the LASIK procedure, for example infection or inflammation. For more information visit its web site at [www.anamedinc.com](http://www.anamedinc.com).

### Conductive Keratoplasty (CK)

This is an exciting, new and safe treatment for correcting reading vision and longsight (up to around +3.00 dioptres). New research shows that it may also be effective for treating astigmatism, even that which remains after LASEK or LASIK, allowing us to fine-tune for even better vision.



The whole treatment can be performed in minutes. Many surgeons are now offering CK worldwide. CK uses a high-tech probe to produce a brief pulse of radio waves applied to the peripheral cornea. This causes a mild contraction of collagen fibres around the edge of the cornea, rather like a belt being tightened up a couple of notches. As a result, the cornea becomes more curved (steeper) in the centre and so increases the focusing power of the eye.

**Figure 1.1 – CK can gently reshape the cornea in minutes, and appears to offer a safe and effective treatment for longsight, reading vision and astigmatism.**

This appears to be a safe and effective procedure. The benefits are that: i) the important central part of your cornea, through which you see, isn't disturbed, ii) the epithelium isn't removed, iii) no cut or LASIK-type flap needs to be made, and iv) no laser is needed, which is attractive to some patients.

Another exciting and increasingly popular use of CK is in the elimination of the need for reading glasses in those over 40 who have otherwise good distance vision. This is achieved through creating what is known as blended vision. Basically, one eye is made mildly shortsighted (again by a slight steepening of the cornea). The CK effect actually produces a multifocal eye, giving a good depth of focus. This allows you to still use both eyes together for clear distance vision, while the CK treated eye has some extra help for reading. This can allow you to keep out of reading glasses for a number of years. Because we need ever stronger help to read as we get older, you will eventually need glasses again. You may be able to have a second CK procedure to restore reading vision.

### Laser Thermal Keratoplasty (LTK)

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The cornea can be steepened in the same way as in CK, but this time with a laser. The laser energy causes heating and contraction of the collagen fibres. The system was developed by the Sunrise Corporation but never achieved widespread popularity, due to regression of effect for many patients.

### Radial Keratotomy (RK)

This microsurgical technique involves making deep incisions in the corneal stroma, to most of its depth. The cuts are made with a diamond blade in a spoke-like fashion, sparing the central part of the cornea. These cuts weaken the corneal periphery causing it to bulge outwards, while at the same time flattening the central part and thus reducing any shortsight. Usually four or eight incisions are made.

The technique was refined by Fyodorov, a Russian ophthalmologist in the 1970s. RK was popular during the late 1980s and early 1990s but then dropped dramatically in popularity with the advent of laser eye surgery. It never achieved the same level of interest in the United Kingdom as it did in America.

RK has a number of disadvantages, and these have contributed to its reduction of use. The change in refraction that the RK incisions produce is not highly predictable, as it depends on the way that each patient's incisions heal. Patients may be left with varying degrees of shortsight and astigmatism, and hence may continue to need glasses for distance vision. Secondly, over time many patients tend to have an increasing flattening of the cornea, resulting in overcorrection and longsight. A ten-year study called the Prospective Evaluation of Radial Keratotomy (PERK) found that 43% of patients became longsighted after surgery for shortsight. Such patients with so-called progressive hyperopia (or consecutive hyperopia) are not happy. For those in the reading glasses age group, shortsight at least means that there is a distance close to, where objects are in clear focus. However in longsight, there is nowhere with a naturally clear focus, with distance vision being blurred, and near objects being even more so.

The application of the excimer laser to the correction of refractive errors led to a large movement of surgeons away from incisional microsurgery to the newer photorefractive keratectomy.

A variation of RK is AK (arcuate or astigmatic keratotomy) for the treatment of astigmatism. A modern form of AK which has become more popular is called Limbal Relaxing Incisions (LRIs). Arcuate incisions are placed in the thicker tissue near where the cornea meets the white of the eye. LRIs can be used to treat mild astigmatism alone, or reduce higher degrees of astigmatism prior to laser vision correction.

### Automated Lamellar Keratoplasty (ALK)

The technology we now use in LASIK to create a corneal flap with a microkeratome was originally developed and used to treat refractive errors in a different way.

A flap is created in the same way we do today for LASIK, and folded back out of the way. The microkeratome is used a second time but now to remove a disc of tissue rather than another flap. The diameter and thickness of the excised disc of cornea determines how much refractive error is corrected. Although high degrees of shortsightedness could be treated, the results were unfortunately quite unpredictable. Because of its much greater precision, we now use a laser to remove this disc of tissue.

### Intrastromal Corneal Ring Segments (Intacs™)

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Developed by the Keravision Corporation, these implantable ring segments were approved in April 1999 for the treatment of mild shortsight. Your prescription must be no greater than -3.00 dioptres, with 1 dioptre or less of astigmatism. (See chapter 3 to learn more about reading your prescription.) However, Intacs™ doesn't correct astigmatism and, if you are astigmatic, you will still have some distortion in your vision after the treatment.

The surgeon cuts two small channels in the edge of your cornea and inserts a small plastic ring segment into each. These rings stretch and flatten the central part of the cornea, and so reduce or eliminate any mild myopia. If you remove the segments, most people's eyes will return to their original shape, but not all. Because of this, the FDA did not allow the use of the term "reversible".

The procedure can be carried out with anaesthetic drops only, and takes about 15 minutes per eye. The eyes can be uncomfortable afterwards, and it will take longer for the vision to settle down compared to LASIK. You can expect to pay a price similar to that of LASIK or LASEK.

Intacs™ has not achieved anywhere near the level of popularity of laser vision correction. Many surgeons feel that mild shortsight can be very effectively treated with LASEK or LASIK, with the added benefit of correcting any astigmatism at the same time.

**This guide is an extract from Dr. David Allamby's new book, written for anyone considering laser eye surgery, and available March 2006**

**Call us now on 0845 3300010 to find out more, and to book your consultation**