



The ROYAL COLLEGE of  
OPHTHALMOLOGISTS

Patient Information

# Refractive Lens Exchange

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# What is Refractive Lens Exchange?

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A **cataract** is a misting up of the natural lens, which sits just behind the pupil and helps to focus light on the retina. Cataract surgery involves replacing the misty natural lens with a small, clear synthetic implant called an *intraocular lens* (IOL). The focusing power of the IOL can be chosen to reduce dependence on glasses after surgery.

*Refractive Lens Exchange* (RLE) is identical to modern cataract surgery. Both operations involve replacing the natural lens with an IOL. The only difference is that cataract surgery is performed mainly to correct blur or light scatter caused by a misty natural lens; whereas RLE is performed to reduce the need for glasses or contact lenses.

There are two main IOL types:

- *monofocal IOLs* – monofocal IOLs aim to reduce spectacle dependence for distance (driving) vision
- *multifocal IOLs* – multifocal IOLs aim to reduce spectacle dependence for a wider range of activities, including intermediate (computer screens) and near (reading) vision

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**IOL implantation is a bit like building your glasses or contact lenses into your eyes**

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If you are suitable for RLE, your surgeon will discuss which IOL type is the best option for you

## What are the benefits?

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About four out of five patients are completely free of glasses after RLE with widely used contemporary multifocal IOLs.

If you do need help from glasses after surgery, it is usually for a specific activity in the near, intermediate or distance range.

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**Approximately 95% of patients are satisfied with the outcome of surgery, and many describe it as life changing**

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RLE eliminates the need for cataract surgery in later life, and it is often preferred to laser vision correction for patients in the retirement age group in whom the early stages of cataract formation are often already present.

Although RLE is often bracketed with cosmetic surgery procedures, the benefits are mainly functional. It is designed to make you less dependent on glasses and contact lenses, helping you to lead an active lifestyle more easily.

In the absence of a new health problem in the eye, vision normally remains good, and your spectacle prescription normally remains stable after RLE. If you do experience any deterioration in vision in the years after surgery, it can often be reversed with a one-off minor laser procedure called YAG capsulotomy.

## Who is suitable for RLE?

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If you are over 50 years of age and have a glasses prescription higher than the normal range for laser eye surgery, you are likely to be suitable for RLE.

Almost any level of **myopia** (short sight) or **hyperopia** (long sight) can be corrected by RLE, and IOLs with built in **astigmatism** correction are available. Lens implantation techniques can be combined with laser eye surgery in suitable patients to extend the range of astigmatism treatment or fine-tune the focus outcome.

You may not be suitable for multifocal IOL implantation if you have pre-existing problems with your eye health.

# What are the alternatives?

## Vision correction surgery alternatives

RLE is one of three main categories of operations to correct vision. The other two are *laser vision correction* and *phakic intraocular lens (PIOL)* implantation.

- Laser vision correction does not require a lens implant, and works by altering the curvature and focusing power of the front surface of the eye
- PIOLs are lens implants that sit in front of the natural lens rather than replacing it

## Laser eye surgery or PIOL implantation are generally better options than RLE for younger patients who still have a clear, flexible natural lens

This includes most patients under 50 years old. Laser vision correction is a relatively low risk option for many patients over 50 years of age with a lower prescription; but the balance shifts as you get older and both flexibility and clarity of the natural lens diminish. RLE is the default option for vision correction surgery in the over 65 age group, but laser vision correction may still be a better alternative for patients with no signs of cataract and good eye surface health.

Your surgeon will advise on your best treatment options after reviewing your test measurements and your eye health.

## IOL alternatives

Different lens implants suit different patients, and not everyone will benefit from multifocal IOL implantation.

*Monofocal IOLs* may be more suitable if you have other eye problems or if you are worried that you may not cope well with the optical side effects of multifocal IOL implantation. Monofocal IOLs have fewer optical side effects than multifocal IOLs, but do not provide freedom from glasses for such a wide range of activities.

The most commonly used approach in standard cataract surgery is to select monofocal IOLs aiming to leave your eyes equally focused in the distance. Glasses are then usually required for reading and near work.

A common alternative approach using monofocal IOLs is to aim for clearer distance vision in one eye, and clearer vision at arms' length in the other. With both eyes open, binocular visual input combines to extend the range of focus, improving vision for computer screens and working with your hands.

Although you would normally still need glasses for reading, near vision is at least partly restored, with relatively little compromise optically. This spread of binocular focus is sometimes called *micromonovision*. It can be a good intermediate choice if you would like more freedom from glasses but do not want, or do not have access to, multifocal IOLs.

## Your surgeon will discuss the pros and cons of different implant choices in RLE with you at your initial consultation

## Continuing in glasses or contact lenses

RLE is elective. This means you can choose to proceed with it at any time, or not at all. The alternative is staying in glasses or contact lenses.

Glasses are risk free but may limit the range of activities you can do confidently and comfortably – particularly sport and exercise.

Although there are many successful lifelong contact lens wearers, comfort and tolerance tends to diminish with age. Varifocal glasses are often the main alternative to RLE for older patients. Varifocal glasses have their own optical side effects. For example, having the lower part of the varifocal lens focused for reading can make it difficult to walk downstairs confidently. Multifocal IOLs provide the range of focus in a different way, and trouble adapting to varifocal glasses does not mean that you will also have trouble adapting to multifocal IOLs.

Contact lenses provide good all-round vision. They do not mist over during sport and will help you to be more active; but they can be inconvenient when travelling, make water sports more difficult, and should not be worn whilst showering or during sleep. Contact lens wear is sometimes associated with eye surface discomfort, and may be complicated by sight threatening infection.

## Risks, side effects and benefits of RLE should be balanced against those for continued contact lens wear and varifocal glasses since these are the main alternatives for people considering sight correction surgery



## How is RLE performed?

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RLE is performed using drop anaesthetic supplemented by an injection in the back of your hand to relax you if required. Anaesthetic may also be washed around the back of the eye to prevent excessive eye movement. A spring clip holding the eyelids apart allows you to blink safely during surgery.

Your surgeon will be looking through a microscope to perform the surgery. You will be lying down under a surgical tent with fresh air coming in underneath. A sticky plastic drape covers the skin around your eye and sticks the eyelashes out of the way.

Some centres offer surgery for both eyes on the same day. More commonly, second eye surgery is delayed for a day or longer to ensure that the recovery in your first eye is progressing well. The focus outcome in your first eye can also be used to help guide IOL selection for your second eye.

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**The surgery typically takes about 20 minutes per eye. You can return home on the same day as surgery**

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Strong pupil dilating drugs are given as drops or as a pellet placed under the lower eyelid to prepare your eye for surgery.

Essential steps in surgery are:

- Entry points – formation of small self-sealing entry points in the front of the eye at the junction of the white of the eye and the cornea
- Capsulotomy – removal of a circular disc from the front of the membrane covering the natural lens called the lens capsule (think of the skin of a grape and you will have the right mental image of the thin, clear covering of the natural lens)

- Phacoemulsification – liquefaction and removal of the natural lens from within the lens capsule using a high frequency vibrating probe, fluid washing, and vacuum
- IOL insertion – injection of the IOL and unfolding into the natural position within the lens capsule using a supporting gel to fill the front of the eye
- Wash out and refilling – wash-out of the supporting gel and refilling with fluid and antibiotics

*Femtosecond* lasers are sometimes now used in a preparatory stage before going through to the operating theatre. Femtosecond lasers are costly and provide no proven benefit for your vision after RLE or cataract surgery, but they may make some stages of the operation (capsulotomy in particular) easier for surgeons to perform safely and consistently. This additional laser stage takes about five minutes, and is performed using eye-drops to anaesthetise your eye.

## What are the risks?

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In all forms of eye surgery, problems can occur during the operation or afterwards in the healing period. Problems can result in permanent, serious *loss of vision* (vision worse than the driving standard in the affected eye that cannot be corrected with glasses or contact lenses).

More commonly, problems can be corrected with changes in medication or additional surgery. Typically, these additional operations feel like the original surgery and have a similar recovery period.

### **Loss of vision**

Permanent, serious loss of vision is significantly more common after RLE than after laser vision correction or PIOL implantation, affecting approximately 1 in 500 patients. This may mean vision worse than the [driving standard](#) or, in some cases, complete loss of vision in the affected eye.

Permanent serious visual loss is typically caused by damage to the retina. This can result from infection or an inflammatory response after surgery, *retinal detachment* after surgery, or bleeding during surgery. Some problems occurring during surgery increase the risk of sight threatening problems afterwards. These include a common complication of surgery called posterior capsular rupture, (breakage of the membrane just behind the IOL).

The UK benchmark rate for capsule rupture for all cataract surgeons is just under 1.5%. Experienced surgeons have a lower rate, but all surgeons have at least some cases affected by posterior capsular rupture. It is not always possible to implant a multifocal IOL safely if posterior capsular rupture has occurred, and this may mean greater than anticipated reliance on glasses after surgery.

### **Additional surgery**

Second operations may be required to correct a complication from the initial surgery. This could include lens repositioning or exchange, surgery to retrieve lens fragments from the back of the eye, or retinal detachment repair. With or without RLE, retinal detachments are more common if you are very shortsighted; but the risk of retinal detachment is approximately five times higher in the first four years after cataract surgery or refractive lens exchange.

Statistical techniques (*biometry formulae*) and eye measurements (*biometry*) are used to guide selection of the IOL required to correct your vision. Limitations on the accuracy of these techniques mean that laser vision correction to fine tune the focus is sometimes required to touch up the visual result after RLE.

The commonest reason for visual deterioration after RLE is *posterior capsule opacification* (PCO). This is a gradual misting over of the membrane just behind the IOL, which affects many patients. PCO may occur months or years after surgery, and is normally treated successfully with a one-off minor laser procedure called YAG laser capsulotomy.

### **Risks of contact lens wear**

Continuing in contact lenses is often the main alternative for people considering sight correction surgery. If you follow the right safety advice, contact lens wear is low risk; but approximately 1 in 3000 wearers each year will develop a serious corneal infection.

To minimise this risk, you should not swim or shower in contact lenses, and should not wash them in tap water. Sleeping in contact lenses, including those designed for overnight wear, increases the risk of infection significantly. Soft, daily disposable lenses are safer than non-disposable lenses.

## What are the side effects?

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Side effects are problems which most patients experience to some degree after surgery. They normally improve with time, but do not always resolve completely.

### Vision

Most patients experience some light scatter side effects and unwanted images in the early months after RLE.

Visual side effects vary with type of IOL implanted, and are often more noticeable in some lighting conditions than others. Patients are commonly aware of a shadow or shimmering arc of light in their peripheral vision after *monofocal* or *multifocal* IOL implantation. Some types of multifocal IOLs tend to cause halos around lights. Blur or ghost images are more common with others; but almost any form of light scatter side effect can occur. It is generally accepted that all forms of multifocal IOL are associated with more optical side effects than monofocal IOLs. However, multifocal IOLs all produce a greater range of glasses freedom.

Optical side effects may initially interfere with work or leisure activities, and night driving in particular. But they tend to diminish with time. 19 out of 20 patients are satisfied or very satisfied with their vision three to six-months after multifocal IOL implantation, and laser procedures to treat residual defocus or posterior capsular opacification (YAG capsulotomy for PCO) are often helpful in accelerating adaptation in the remainder.

But approximately 1% of patients cannot adapt, and will elect to undergo IOL exchange, a potentially complicated procedure swapping the multifocal IOL for a monofocal IOL.

### Eye comfort

Some eye surface discomfort is common in the early months after most forms of eye surgery. This is usually mild after RLE, and highly variable – often affecting one eye more than the other. Treatment and prevention are based on making sure your eye surface is healthy before and after surgery. Lubricant eye drops can be helpful, and can be taken safely in addition to your other medication when required. For patients with a normal eye surface prior to surgery, lasting problems are unusual.

### Eye Appearance

Red blotches are often visible on the white of the eye after any form of eye surgery. These are called subconjunctival haemorrhages, and are caused by a small leak of blood under the mucous membrane covering the white part of eye wall. Although they can be quite unsightly, red blotches are temporary, and do not affect eye health; but they can take up to six weeks to go away completely.

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**Most IOLs are not visible. But people may occasionally notice a glint in your eye caused by a reflection from the front of the IOL within the pupil**

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## Will RLE affect my future eye health care?

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If you develop a new eye health problem in later life, RLE implantation should not prevent you having successful treatment.

Common eye health problems like [glaucoma](#), [diabetic retinopathy](#), and [age related macular degeneration](#) can be monitored and treated as normal after RLE.

Many patients with hyperopia (long sight) have a relatively small space for fluid circulation through the front of the eye. The space narrows as the natural lens expands with age, leaving these patients vulnerable to a form of [glaucoma](#) caused by blockage of fluid flow that can lead to sudden, painful loss of sight ('angle closure glaucoma').

In patients with this predisposition to later problems called 'a shallow anterior chamber', RLE can both reduce the need for glasses and remove any risk of future problems due to angle closure. This is because IOLs are thinner than the natural lens. So RLE or cataract surgery creates more space for fluid circulation in the front of the eye.

# How can I reduce the risk of problems?

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Most patients have IOL implantation under local anaesthetic. You can eat and drink normally before surgery, and should take any regular medication as usual.

Most surgeons work with an anaesthetist to monitor your health during surgery and optimise your comfort, administering sedation where necessary. Keep your breathing calm, stay as relaxed as you can, and try to keep your head still after the surgeon has positioned it comfortably.

You can help your surgeon apply the drape and stick your eyelashes out of the way by opening both your eyes wide at the beginning of surgery. Blinking is no problem after the draping is complete. Just look straight up ahead to the bright operating light with both eyes open, but blink when you need to. Looking up to the bright microscope light helps to keep your eyes in the best position.

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## Your surgeon will talk you through the procedure, encouraging you at every stage

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Let your surgeon know if you feel any discomfort, and tell your surgeon if you need to cough, sneeze or take a break.

For the preliminary laser stage in laser assisted RLE, your eye is normally held still and the eyelids are kept out of the way with a suction ring. But the same principles apply. To help the surgery go smoothly, simply stare straight up ahead with both eyes open. Try not to squeeze the eyes shut, but blink whenever you need to.

A clear plastic shield is normally taped over the eye at the end of surgery to protect the eye on the way home. Nursing staff will show you how to wear the eye shield at night (normally for one week after RLE).

You can wash and shower normally from day one after RLE. Most surgeons recommend no swimming for a week and no contact sports for a month. Non-contact sports such as gym and jogging can be resumed from day one after surgery. Your surgeon will advise you when it is safe to start driving again. Typically this is within a few days of surgery.

Set a smart phone reminder and use the antibiotic and anti-inflammatory drops as prescribed to help the eyes to heal well. It is good to leave at least two minutes between different types of eye drop so that they each absorb well before the next drop is applied. If you miss the first time or you are not sure, applying a second eye drop is no problem.

Some variability of vision and comfort is normal in the early weeks after RLE, and patience is required. But discomfort is usually mild, and vision normally recovers substantially within two to three days once the pupil dilating drugs have worn off.

Report to your surgeon or an eye casualty department without delay if you have increasing aching pain, light sensitivity, redness, blur after surgery.

Other danger signs, particularly relevant to highly myopic (shortsighted) patients undergoing RLE, relate to the warning signs of a retinal detachment. These are a sudden new shower of *floaters*, flashes of light (even with the eyes closed) and visual field loss (a shadow or curtain spreading across your vision). Most retinal detachments can be repaired without detriment to your vision, but the chances of success are much higher if the detachment has not spread across the centre of your vision.

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**You may not be aware of a problem that requires treatment in the healing phase. So make sure you attend your review appointments even if your eyes feel good**

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## How much does RLE cost?

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Surgery to correct the need for glasses or contact lenses is **not available as an NHS procedure** and is not covered by private health insurance schemes.

Your clinic should be clear from the outset about the total cost of the procedure. Factors affecting cost include the type of IOL used and the use of femtosecond lasers. Monofocal IOLs are generally less expensive than multifocal IOLs, but IOL cost varies widely. Femtosecond lasers are now often used to cut the templates accurately for the initial stages of RLE. This expensive new technology may increase the cost of your procedure.

Follow up clinic visits and treatment for any problems resulting from surgery are usually included in the procedure cost for up to 12 months after surgery. Laser adjustments to focus are often required to obtain the best result from RLE. These are also normally included in the procedure fee.

Most clinics do not accept an open-ended liability and will charge for additional treatment relating to natural prescription changes or a new problem with eye health. An additional fee may be charged for YAG capsulotomy, a one-off minor laser procedure that is often required months or years after RLE.

# Refractive Surgery Glossary of Terms

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**Accommodation** the reflex by which the eye brings a near object into focus by changing the shape of the natural lens. The *natural lens* gets less flexible with age, and powers of accommodation diminish. This affects reading vision and the ability to compensate for *hyperopia*.

**Artisan/Verisyse PIOL** this is a type of *PIOL* that is clipped on to the *iris* during implantation. *PIOLs* are a commonly used alternative to *laser vision correction* for younger patients.

**Astigmatism** irregular defocus, or an eye that is 'more rugby ball shaped than football shaped.' The first number in your prescription for glasses describes the amount of long or short sight. The second number describes the amount of astigmatism. Most of us have at least some astigmatism, and a small amount can even help extend the range of activities you can do without reading glasses when you get older.

**Biometry** this test involves measurement of the eye and a set of calculations (biometry formulae) that help determine the right focusing power for an *IOL* before *cataract surgery* or *RLE*.

**Binocular vision** this is vision measured with the two eyes open.

**Cataract** when the *natural lens* gets misty enough to make vision hazy, it is called a cataract.

**Cataract surgery** this is surgery to replace the natural lens with an *IOL*. Cataract surgery is identical to *RLE* but is performed in patients who cannot see clearly despite using glasses or contact lenses with the main aim of restoring clear vision.

**Conjunctiva** the membrane covering the white of the eye. The conjunctiva produces mucus to help spread the watery *tear film* over the eye surface.

**Cornea** the clear part of the eye wall at the front of the eye. Two thirds of the focusing power of the eye is in the cornea.

**Corneal epithelium** the corneal skin layer

**Corneal topography** this is a scan that maps the surface curvature of the cornea.

**D or Dioptre** a unit for measuring the refractive power of a lens.

**Excimer laser** this type of laser removes tissue by non-thermal vapourisation (photoablation). Excimer lasers are extremely accurate and do not damage the surrounding tissues. They are used in *LASIK* and *surface laser treatments (PRK, LASEK and TransPRK)*.

**Femtosecond laser** this type of laser is designed to cut any 3D shape in clear eye tissues such as the *natural lens* or the *cornea* with a high degree of accuracy. They work by creating a 3D pattern of tiny gas bubbles, which is traced through the target tissue at high speed. Femtosecond lasers are used in *LASIK*, *SMILE*, and increasingly in *RLE* and *Cataract surgery*.

**Floater** floating shadows cast on the retina by opacities in the *vitreous*. Most of us are aware of *floaters* in some lighting conditions.

**Glaucoma** this is a condition in which the optic nerve is gradually damaged causing the visual field to contract. Left untreated, patients with glaucoma may develop 'tunnel vision.' Glaucoma is often associated with a higher than normal *intraocular pressure*, and treatment is centred on drugs or surgery to lower the *intraocular pressure*.

**Hyperopia** long sight. People with hyperopia typically have good vision as young adults. As they get older, they find themselves reliant on glasses for reading, and then for the distance vision too. Younger people are able to compensate for hyperopia by *accommodation*. The amount of hyperopia is shown by a positive number in your spectacle prescription.

**ICL (intraocular collamer lens)** this is the most commonly used type of *PIOL*. It is implanted behind the *iris* and vaults over the *natural lens* – a bit like a contact lens implanted in the eye. *ICL* implantation is a commonly used alternative to *laser vision correction* in younger patients.

**IOL (intraocular lens)** *IOLs* are small synthetic lens implants that are used to replace the natural lens in cataract surgery and *RLE*.

**Intraocular pressure (IOP)** this is the pressure of fluid within the eye. It is often measured with a puff of air in routine eye checks or (more accurately) with a yellow drop and a blue light.

**Iris** this is the coloured part of the eye behind the cornea that expands and contracts in response to light to dilate or constrict the pupil.

**LASEK (laser assisted sub-epithelial keratectomy)** this is a form of *surface laser treatment* in which the corneal skin layer is soaked with dilute alcohol to loosen it before removal.

**Laser vision correction** correction of sight using *excimer* and/or *femtosecond* lasers to alter the curvature and focusing power of the cornea.

**LASIK (laser in situ keratomileusis)** this is the commonest form of laser vision correction in which a thin protective flap is created using a femtosecond laser. The protective flap is moved aside by the surgeon before optical reshaping of the cornea using an excimer laser. The flap is then replaced, and adheres without stitches, keeping the corneal skin layer intact and giving a fast visual recovery.

**Meibomian glands** the specialized oil glands in the eyelids that pump out a stabilizing layer of oil each time we blink that floats on top of the watery layer of the *tear film*. Inflammation of the eyelid margins upsetting this layer (blepharitis or meibomitis) is one of the commonest reasons for eye discomfort.

**Micromonovision** this is the name often given to the strategy of aiming for a clearer distance focus in one eye and a clearer focus at arms' length in the other. Input from the two eyes combines to extend the range of focus for patients in the reading glasses age group undergoing vision correction surgery.

**Monofocal IOL** an IOL with one clear point of focus. These are the lenses most commonly used in standard cataract surgery. They have fewer optical side effects than multifocal lenses, but glasses are normally required for at least some activities after implantation.

**Multifocal IOL** an IOL with more than one point of clear focus. Multifocal IOLs are often used in RLE in order to help increase freedom from glasses in the near range as well as providing good distance vision.

**Myopia** short sight. People with myopia are able to see up close but not in the distance. They typically first need glasses as school age children. The amount of myopia is shown as a negative number in your spectacle prescription.

**Natural Lens** the natural lens sits just behind the pupil and is suspended by a trampoline like array of microligaments from the ciliary muscle, which contracts during *accommodation*. The natural lens accounts for one third of the focusing power of the eye and is the flexible element of focus. The natural lens gets less flexible with age. It also becomes less clear as we get older. If the natural lens gets misty enough to make vision hazy, it is called a *cataract*.

**Phacoemulsification** this is the standard technique for liquefying the natural lens in *cataract surgery* and *RLE*. Ultrasound energy delivered from the tip of a fine, hollow probe liquefies the lens. Fluid is washed continuously into the eye around the probe, and the liquefied lens material is sucked away. Where previously the natural lens had to be shelled out like a pea, phacoemulsification allows it to be removed through a tiny, key-hole entry into the eye. This development revolutionised modern cataract surgery. *Femtosecond lasers* are now commonly used

to break the lens up into small fragments before phacoemulsification.

**Posterior capsule opacification (PCO)** in *cataract surgery* and *RLE*, the *IOL* is implanted within the capsule of the natural lens. This thin, clear membrane then shrink-wraps the IOL and stabilises it in the natural position in the eye. As part of this healing up process, the membrane often goes misty, causing gradual loss of vision after surgery. This is posterior capsule opacification (PCO). It can be treated successfully with a one-off minor laser procedure called *YAG capsulotomy*.

**Presbyopia** age related loss of reading vision and the ability to focus on a near object without help from glasses.

**PIOL (phakic intraocular lens)** an eye that still has the natural lens in place is described as 'phakic.' PIOLs are small, synthetic lenses that are implanted in the eye without taking the natural lens out. PIOL implantation is an alternative to laser vision correction for younger patients.

**Posterior vitreous detachment (PVD)** as we age, the vitreous shrinks and will often peel off the back of the eye. For some of us, this event passes unnoticed. In others, a new shower of floaters will prompt them to attend for an eye examination. Doctors examining patients after a PVD look carefully for any abnormal attachment of the gel to the retina which could lead to a retinal detachment.

**PRK (photorefractive keratectomy)** this is a form of *surface laser treatment* in which preparatory removal of the corneal skin layer is done by the surgeon.

**Refraction** this is the test that is done to determine the numbers in your spectacle prescription and the amount of *myopia*, *hyperopia* or *astigmatism*.

**Refractive surgery** this is another name for vision correction surgery or surgery to reduce the need for glasses and contact lenses.

**Retina** the carpet of light sensitive cells lining the back of the eye, which is sometimes described as 'the film in the camera.' Images are focused on the retina by the *cornea*, the *natural lens*. Information from the retina is fed through the *optic nerve* to the visual areas of the brain.

**Retinal detachment** the retina sometimes detaches from the eye wall and its blood supply. Urgent surgery is then required to re-attach the retina in order to prevent visual loss. Patients with high myopia are more likely to get a retinal detachment. Retinal detachments are also more common in the early years after cataract surgery or RLE. Warning signs are a sudden change in vision with field loss (a dark shadow in part of the visual field); flashing lights (arcs of light – even with the eyes closed); and a sudden new shower of *floaters*.

**RLE (refractive lens exchange)** this is surgery to replace the natural lens with an *IOL*. RLE is identical to cataract surgery but is performed in patients who can see clearly if they wear glasses or contact lenses. The aim of RLE is to help people to see clearly for more activities without glasses or contact lenses.

**SMILE (small incision lenticule extraction)** this is a form of *laser vision correction* in which a lens shaped piece of corneal tissue is marked out using a femtosecond laser and removed surgically through a small incision.

**Surface laser treatment** a collective term for *PRK*, *LASEK*, *TransPRK* and other similar forms of *laser vision correction* in which optical reshaping of the cornea is performed on the corneal surface after removal of the corneal skin layer.

**TransPRK (transepithelial PRK)** this is a form of *surface laser treatment* in which the corneal skin layer is removed by the laser itself.

**Tear film** a multilayered wet film covering the front of the eye, which is essential for vision and comfort. A layer of mucus produced by specialized cells in the *conjunctiva* helps the watery layer of the tear film to spread over the eye. The watery layer is stabilized between blinks by an oily layer that forms a thin film (a bit like petrol floating on water) and acts to prevent localized evaporation. The oily layer is pumped out from specialized glands in the eyelids called *meibomian glands* each time we blink.

**Visual acuity** this is the main measurement of how well we can see and is tested by asking you to read down a chart which has smaller letters on each line. The lower you can read, the better your visual acuity is. Measurements are expressed as a fraction. If your visual acuity is 6/6 (normal) then you can see at 6 meters what a normally sighted person can see at 6 meters. If your vision is 6/9 you can see at 6 meters what a normally sighted person can see from 9 meters away et cetera. In the USA, the same measurement is made in feet, with 6 meters being roughly 20 feet. Many people are familiar with the American definition of normal '20/20' vision. This is the same as 6/6 vision in the UK measurement.

**Vitreous** this is the gel filling the back of the eye. It tends to shrink as we age and accumulates wrinkles and opacities that cast floating shadows (*floaters*) on the retina.

**Wavefront scan** this is an optical map of your eye used to guide modern *excimer laser* treatments.

**YAG capsulotomy** a one-off minor laser procedure used to treat *posterior capsule opacification* (PCO).