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Consultation Document

# Patient Information: laser vision correction

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## 1 What is Laser Vision Correction?

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- 1.1 Modern surgical lasers are able to alter the curvature and focusing power of the front surface of the eye (the cornea) very accurately to correct short sight (myopia), long sight (hypermetropia), and astigmatism.
- 1.2 Three types of procedure are commonly used in the UK: LASIK, surface laser treatments (PRK, LASEK, TransPRK) and Small SMILE. Risks and benefits are similar, and all these procedures normally produce very good results in the right patients.  
  
Differences between these laser vision correction procedures are explained below.
- 1.3 If you are suitable for laser vision correction, your surgeon will discuss which type of procedure is the best option for you.

## 2 What are the benefits?

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- 2.1 For most patients, vision after laser correction is similar to vision in contact lenses before surgery, without the potential discomfort and limitations on activity.
- 2.2 Spectacles may still be required for some activities after treatment, particularly for reading in older patients.
- 2.3 Over 95% of patients are satisfied with the outcome of surgery, and many describe it as life changing. Although laser vision correction is often bracketed with cosmetic surgery procedures, the benefits are primarily functional. It is designed to make you less dependent on spectacles and contact lenses, helping you to lead an active lifestyle more easily.
- 2.4 Short sight and astigmatism normally stabilize in the late teens or early 20s, but natural prescription changes can occur at any stage in life. So laser vision correction sometimes needs to be repeated.

## 3 How much does laser vision correction cost?

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- 3.1 Surgery to correct the need for spectacles or contact lenses is not available as an NHS procedure and is not covered by private health insurance schemes.
- 3.2 Your clinic should be clear from the outset about the total cost of the procedure. Follow up clinic visits and treatment for any problems resulting from surgery, including additional laser treatments to fine-tune the visual result are usually included in this cost for up to two years after surgery. Although most prescription changes from three months after surgery are very small, it can take up to two years for the results of laser vision correction to stabilize definitively. Most problems requiring further treatment would occur within this period.

- 3.3 Most clinics do not accept an open-ended liability and will charge for additional treatment relating to natural prescription changes occurring later than two years after laser vision correction or treatment required for any unrelated problems with eye health.

## 4 Who is suitable for laser vision correction?

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- 4.1 You must be over 18 years of age and have a stable spectacle prescription. This is normally defined as no change greater than 0.5 units (0.5D) in the last two years.
- 4.2 The range of spectacle prescriptions that can be treated effectively is approximately:
- Up to -10.00D of myopia or short sight
  - Up to +4.00D of hypermetropia or long sight
  - Up to  $\pm 6.00D$  of astigmatism
- 4.3 Whereas myopia and astigmatism cause poor distance vision from the teenage years on, hypermetropia typically affects people more as they get into their thirties and above. Younger patients with hypermetropia often have no problems seeing well. This is because flexibility of the eye's natural lens allows them to compensate. But as the natural lens stiffens with age, hypermetropic patients first find themselves more dependent on reading spectacles than people with normal sight, and then find that they need spectacles for the distance too.
- 4.4 Age related loss of reading vision can often be helped with laser vision correction by targeting a good distance focus in one eye, and good vision at arms' length in the other. With both eyes open, binocular visual input combines in our one view of the world to help at least partially restore near vision with relatively little compromise optically. Variations on this approach, marketed under a variety of brand names, have become the default strategy for improving the near range in older patients undergoing laser vision correction.
- 4.5 You may not be suitable for laser vision correction if you have other problems with your eye health including cataracts, or problems with eye surface health.
- 4.6 Many contact lens wearers are incorrectly diagnosed as having dry eyes and are told that they are therefore unsuitable for laser vision correction. Eye surface discomfort is common in contact lens wearers and is often treatable. Laser vision correction is often a good solution for patients who are having difficulties with contact lens wear.

## 5 What are the alternatives?

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### Vision correction surgery alternatives

- 5.1 Lens implantation techniques that have evolved from modern cataract surgery may be more suitable for some patients.

- 5.2 There are two main categories of vision correction based on lens implantation: refractive lens exchange (RLE) and phakic intraocular lenses (PIOLs).
- 5.3 RLE is identical to modern cataract surgery, but performed with the main aim of increasing freedom from spectacles. RLE is often preferred to laser vision correction for patients in the retirement age group in which the early stages of cataract are common. In RLE, the natural lens is replaced with a lens implant. A variety of different implants are used including multifocal lenses designed to reduce reliance on spectacles for near, intermediate and distance vision.
- 5.4 In younger patients, artificial lenses called phakic intraocular lenses (PIOLs) are often a good alternative where the spectacle prescription is outside the normal range for laser vision correction. PIOLs are implanted in front of the natural lens without replacing it.

### **Alternative laser procedures**

- 5.5 The main difference between laser vision correction procedures is speed of recovery. Patients undergoing LASIK are often able to return to work the day after surgery. Visual recovery after SMILE may be slower, and patients undergoing surface laser treatments (PRK, LASEK, TransPRK) may need a week or longer before they are at the driving standard. Although visual recovery can be slower after surface laser treatments or SMILE, patients can return to contact sports sooner, whereas LASIK patients need to wait for a minimum of one month. Also, the recovery of eye surface comfort may be slightly faster after SMILE, but differences between techniques are small and mild eye surface discomfort in early period after all forms of laser vision correction is normal. Visual results at three months are equally good for all types of laser vision correction.

### **Continuing in spectacles or contact lenses**

- 5.6 Laser vision correction is elective. This means you can choose to proceed with it at any time, or not at all. The alternative is staying in spectacles or contact lenses.
- 5.7 Spectacles are risk free but may limit the range of activities you can do confidently and comfortably – particularly sport and exercise.
- 5.8 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, swimming or during sleep. Contact lens wear is sometimes associated with eye surface discomfort, and may be complicated by sight threatening infection.
- 5.9 Risks and benefits of laser vision correction should be balanced against those for contact lens wear since this is the main alternative for active people considering sight correction surgery.

## **6 How is Laser Vision Correction performed?**

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- 6.1 All laser vision correction procedures are performed using eye-drop anaesthetic, and a spring clip to allow you to blink safely during surgery. You will be lying down
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throughout. It is usual to operate on both eyes, and the surgery typically takes about half an hour. You can return home on the same day as surgery.

## LASIK

6.2 LASIK (laser in situ keratomileusis) is typically performed using two lasers: one (femtosecond laser) to prepare a thin protective layer (the LASIK flap), which is lifted up before a second (excimer laser) removes a lens shaped piece of tissue to reshape the cornea beneath. The protective layer is then smoothed back and sticks in place and without stitches.

## Surface laser treatments

6.3 Surface laser treatments (PRK, LASEK, and TransPRK) use the same excimer lasers to perform an identical removal of a lens shaped piece of tissue immediately beneath the clear skin layer of the cornea. The clear skin layer regrows over a period of about a week, then smooths off optically to complete the visual recovery over the next three months. While the skin layer is regrowing, the eye surface is normally very sore, and this is one of the main differences between surface laser treatments and LASIK or SMILE, which both aim to keep the corneal skin layer intact. All surface laser treatments produce similar results, and the only difference between them is the way in which the corneal skin layer is removed. In PRK and LASEK the skin layer is removed by the surgeon - in LASEK dilute alcohol is applied to loosen the skin layer first. Some modern excimer laser systems are able to remove the skin layer as part of the reshaping treatment. This is called TransPRK. The area of skin layer removal in TransPRK is reduced to the minimum required for reshaping the cornea beneath, shortening recovery time by one to two days in comparison with PRK and LASEK.

## SMILE

6.4 SMILE (Small Incision Lenticule Extraction) uses a femtosecond laser of the same type used to create a LASIK flap to define a lens shaped piece of tissue that is removed by the surgeon through a small incision to correct focus. This is like LASIK without the LASIK flap, but the thickness of tissue removal is slightly greater and the tissue may be removed from slightly deeper in the cornea. End results are similar to those for LASIK and surface laser treatments.

## 7 What are the risks?

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7.1 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 spectacles 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

7.2 Permanent, serious loss of vision is rare after laser vision correction. In the worst scenario, a form of corneal transplantation may be required to replace a damaged block of tissue in the cornea. Problems that can lead to the need for transplantation include scarring after infection or an abnormal healing response, and an unstable corneal shape – also called corneal ectasia. These problems occur

infrequently, and can often be corrected without transplant surgery. Less than one in 5000 patients require a corneal transplant to restore vision after laser surgery, and good vision can normally be restored when transplantation is necessary although spectacles or contact lenses may be required.

### **Additional surgery**

- 7.3 Much more commonly, a second operation is needed to correct a problem occurring at the time of surgery or afterwards. This would normally be a procedure that feels similar to the original laser vision correction, with a similar recovery period. Some of these procedures need to be repeated. If you have a problem, your surgeon will explain what it is and why further surgery is required. Up to one in 10 patients require some form of additional surgery in order to get the best result. Risks of contact lens wear
- 7.4 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 one in 3000 wearers each year will develop a serious corneal infection.
- 7.5 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.

## **8 What are the side effects?**

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- 8.1 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**

- 8.2 Most patients experience some light scatter side effects in the early period after laser vision correction, particularly those who have treatment for higher spectacle prescriptions. These can take a variety of forms including glare, halos, starbursts and ghost images. Increased flare from oncoming car headlights is a common symptom, and night driving may be difficult at first. With modern laser systems, visual side effects are usually mild and improve within a few months. Lasting problems are unusual, but may still occur.

### **Eye comfort**

- 8.3 Other common side effects are intermittent blurring (variable vision) and eye surface discomfort (dry eye symptoms). Both are caused by reduced stability of the tear film between blinks. Tear film stability improves over a few months after treatment as the corneal surface heals. During the healing period, most patients are able to stay comfortable using tear supplements when required. Eye comfort usually returns to normal within a few months of treatment and, for contact lens wearers in particular, can often be improved after laser vision correction. For patients with a normal eye surface prior to surgery, lasting problems are unusual.

## Eye Appearance

- 8.4 Red blotches are often visible on the white of the eye after any form of eye surgery, and are particularly common after LASIK. These are called subconjunctival haemorrhages, and are caused by a small leak of blood under the clear membrane (the conjunctiva) 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.

## 9 Will laser vision correction affect my future eye health care?

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- 9.1 If you develop a new eye health problem in later life, laser vision correction should not prevent you having successful treatment. Common eye health problems like diabetic retinopathy, and age related macular degeneration are monitored and treated as normal after laser vision correction.
- 9.2 Laser vision correction can affect eye pressure measurements used to check for glaucoma, causing them to under-read, especially in patients who have had treatment for high myopia. Corrections to eye pressure measurement can be applied to help ensure that glaucoma is picked up at an early stage and treated effectively; but it is worth reminding your optometrist or doctor that you have had laser vision correction when they are checking for, or treating glaucoma. A record of your last spectacle prescription before laser vision correction may help them to make adjustments to your eye pressure readings more accurately.
- 9.3 Laser vision correction can reduce the accuracy of focus correction and vision after future cataract surgery, but any detrimental effect is small, and is reducing as more patients who have had previous laser vision correction are entering the cataract age group and modifications to lens implant selection calculations are becoming better understood.

## 10 How can I reduce the risk of problems?

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- 10.1 You can eat and drink normally before surgery, and should take any regular medication as usual.
- 10.2 You have to be awake for laser vision correction so that you can look up to a target light that helps you keep your eye in the right position during treatment. Stay as relaxed as you can during the surgery, and try to keep your head still after the surgeon has positioned it comfortably for you. Most people are anxious prior to surgery. Your surgeon will be used to this, and will talk you through the procedure, encouraging you at every stage. Keep your breathing calm and tell your surgeon if you need a break. An anti-anxiety, muscle-relaxing drug such as diazepam can be helpful, particularly if you have a tendency to squeeze your eyes shut when they are being touched. Discuss this with your surgeon before the day of surgery if you are worried.
- 10.3 Modern laser systems either hold the eye still with gentle suction or have accurate tracking systems that follow eye movements during surgery, and a spring clip is used

to hold the eyelids apart. So you should not worry too much about moving or blinking during the procedure. But try to listen to instructions and keep your eyes on the fixation light when asked to do so.

- 10.4 It is important to keep the eyes well lubricated in the first few hours after treatment, particularly after LASIK. Stay awake, but rest with your eyes closed when you can, and use the lubricant drops you will be given frequently.
- 10.5 You can wash and shower normally from day one after LASIK or SMILE, and once the contact lenses have been removed after surface laser treatment. Most surgeons recommend no swimming for a week and, after LASIK, no contact sports for a month. Non contact sports such as gym and jogging can be resumed from day one after surgery.
- 10.6 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.
- 10.7 Some variability of vision and comfort is normal in the early weeks after surgery, and patience is required. But you should not be afraid to contact your surgeon if you have any concerns, or if you have an injury to the eye. You should contact your surgeon without delay if you have increasing pain, light sensitivity, redness, blur or an injury to the eye followed by pain, blur or watering.
- 10.8 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.

## 11 Glossary

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LASEK	Laser-Assisted Subepithelial Keratomileusis
LASIK	Laser Assisted In Situ Keratomileusis
PIOL	Phakic Intraocular Lenses
PRK	Photorefractive Keratectomy
RLE	Refractive Lens Exchange
SMILE	Small Incision Lenticule Extraction
TransPRK	Transepithelial Photorefractive Keratectomy